The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879

CLINTON S. DARLING, Editor
CHARLES A. BRESKIN, Adv. Mgr.
E. M. GIBSON, Asst. Mgr.
JOSEPH K. COSTELLO, Central Rep.
N. C. ROCKWOOD, Advisory Editor
H. E. HOPKINS, Associate Editor
C. H. FULLER, New York Rep.
LESTER N. WEBER, Western Rep.
GEO. P. MILLER, Manager

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TO SUBSCRIBERS—Date on wrappers indicate issue with which your subscription expires. In writing to have address changed, give old as well as new address

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MEMBER A. B. C. MEMBER A. B. P.

W. D. CALLENDER, President
N. C. ROCKWOOD, Vice-President
GEO. P. MILLER, Treasurer
C. O. NELSON, Secretary

Volume 25 July 15, 1922 Number 14

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Where to Get Help

When a producer, an association executive, or anyone else in the rock products industries is faced with a perplexing problem, it is quite natural for him to turn to ROCK PRODUCTS editors for help and suggestions. It happened a few days ago that when one of the editors entered the office of a national association executive in New England that executive was working on plans to increase the membership of the association. Immediately he outlined the plans and the work already accomplished, and asked for suggestions, which were gladly given.

This individual help is a natural function of the magazine. Whatever it can do to aid the industry or the individual members of the industry it is glad to do. The magazine exists and prospers only as the industry exists and prospers. The two work hand in hand. Because its editors travel much and keep in close touch with field operations and with association activities, these editors can often render aid that would be obtainable in no other way; and because it has gained through real merit its position as the authentic magazine of the industry it is frequently called upon for help.

Editors are at best, of course, only human; they are not oracles, and can not answer all of the complicated and unusual questions which are sometimes put to them. But in such cases they frequently can put the inquirer on the right track to get the information.

Never hesitate to tell ROCK PRODUCTS what your difficulties are, nor to ask for help.

How to Read Rock Products

Keeping in touch with one's industry is a legitimate and necessary part of the business life of every member of that industry. Since he can't spend much of his time in personally keeping in touch, he must do it by practically the only other method left—the regular reading of the trade magazine of that industry.

Every progressive producer of rock products receives regularly his copies of ROCK PRODUCTS, the trade magazine of his industry, but only through proper reading can he get its full value out of it.

Proper reading does not mean the reading of every word. No issue could be filled from cover to cover with material to interest every subscriber; some material is designed to interest one class of readers, and some for another class.

From one to three hours is probably the time to spend on an issue in order to get maximum returns from it. To spend less would mean that important parts have been missed; more time can easily be spent, but ordinarily the additional time will be devoted to matters of less vital interest.

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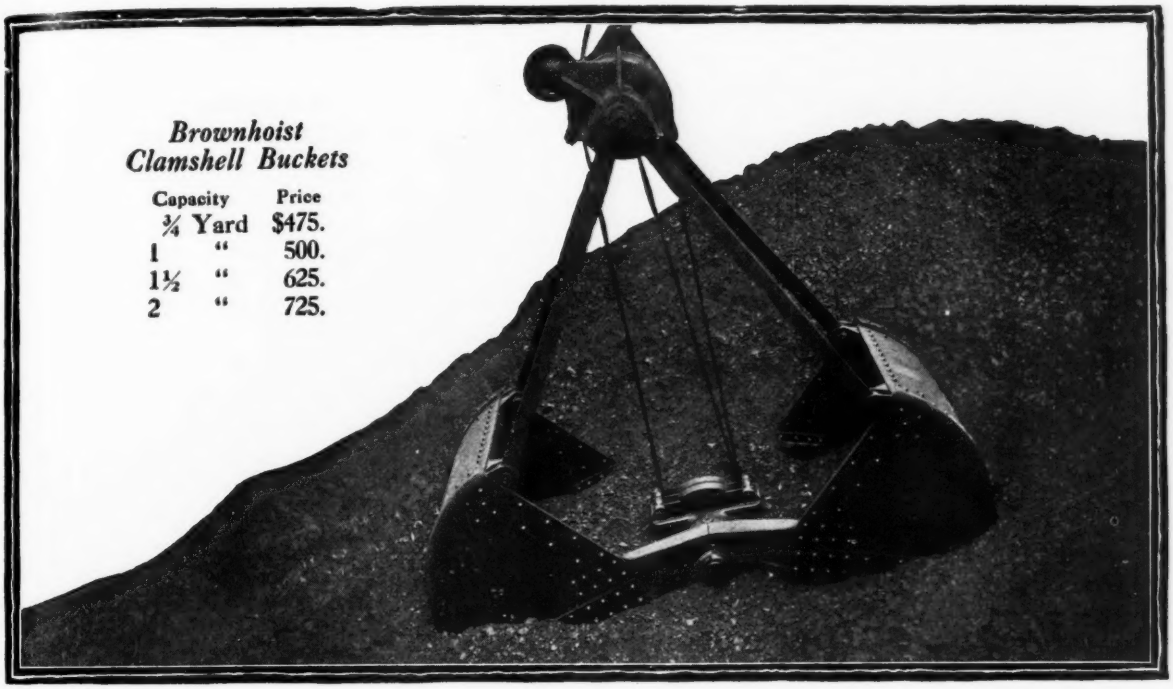

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Every time a Brownhoist clamshell bucket drops on a pile of material it digs deep and comes back with a big load. The above photo shows a clamshell biting into a pile of coal. There can be no doubt about a heaping load here.

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Our clamshell booklet tells more interesting facts about this bucket. May we send you a copy?

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Digging edges

Bronze Bushed

Straight Rope Leads

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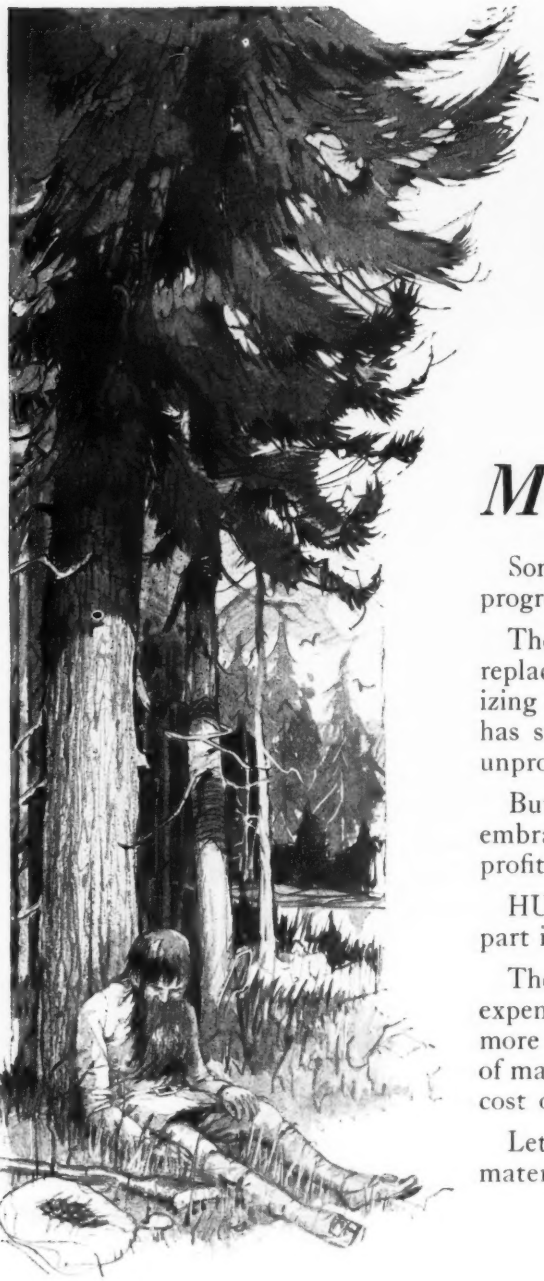

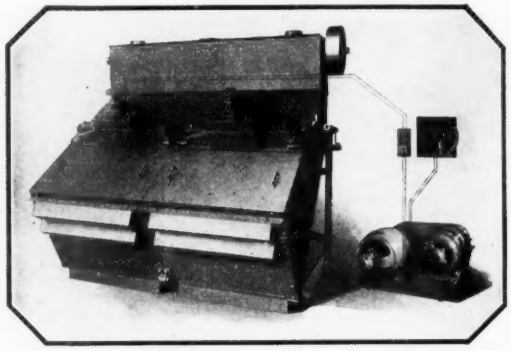

Type 31—Six-Foot HUM-MER *Electric* SCREEN

Modern Rip Van Winkles

Some business men today have their eyes closed to progress just as truly as had Rip Van Winkle.

The automobile has replaced the horse—electricity is replacing steam—wireless and airplanes are revolutionizing communication, but *in their own business* progress has stopped, and they continue the use of antiquated, unprofitable equipment.

But the world moves on and wide-awake companies are embracing opportunities to increase production and profits.

HUM-MER Electric Screens are playing a prominent part in the success of many such firms.

The great capacity, close separation, and low operating expense of the HUM-MER Process is making screening more profitable on almost one hundred different kinds of material. Many users report profits of many times the cost of their HUM-MER installation.

Let us tell you what the HUM-MER will do on your material.

Catalogue 45-R mailed upon request

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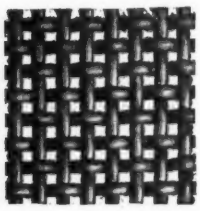
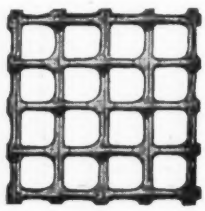
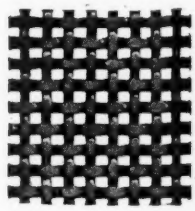
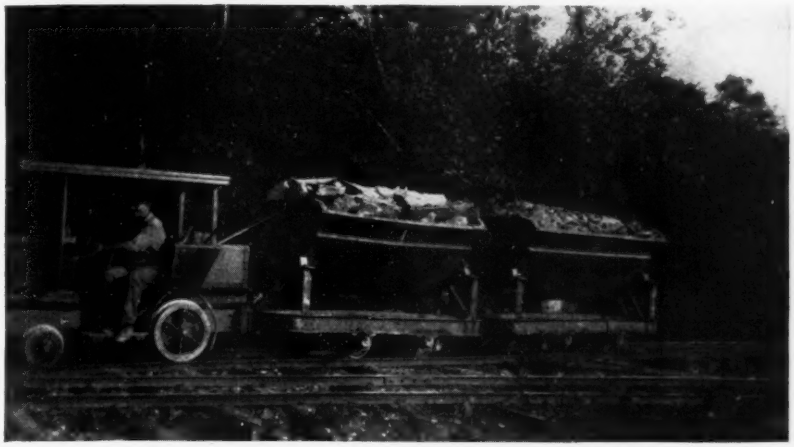
***Manufacturers of* Woven Wire Screens and Screening Equipment**









Saving 45%

THE Blue Ridge Talc Co., Inc., of Henry, Va., have reduced their haulage costs about 45% under 6 ton standard make gasoline locomotive formerly used, by installing locomotive with Ford ton truck power unit, attachments manufactured and complete locomotive assembled by the Brookville Truck & Tractor Co., Brookville, Pa. Attachments including the patented Brookville auxiliary reverse transmission, giving locomotive the Ford ton truck high and low speeds as well as the same pulling power when running ahead or in reverse.

Gas consumption alone in comparison with the 6 ton machine has been reduced from 13 gallons to 4½ gallons, for identically the same work.

This is a saving worthy of your consideration and a few extracts from Mr. Kitson's letter, printed below, tells an interesting and valuable story.

Gentlemen: We are inclosing a small photo of a couple of loaded soapstone cars, with the FORD one-ton truck power unit converted into a locomotive for haulage on our tracks.

Cost of delivering mine run soapstone from quarry to mill has been reduced about 45% with the use of this converted equipment. This will operate nine hours on about four and one-half gallons of gasoline. Any operator familiar with driving a FORD can operate it. Few of us who don't learn how to drive a FORD.

This machine handles two loaded cars of five tons net weight, and each car weighs about 1200 lbs. The haul is down a grade averaging 3½% with several short sections of 5%, and delivers two loads up 5½ grade of 300 feet. This is all done on high. Loads are dumped into crusher, hopper or into air drying sheds. The material after being crushed is pulverized in any mesh from 100 to 350.

Yours truly,
BLUE RIDGE TALC CO., INC.
C. O. Kitson, Sec'y and Treas.

There is the convincing evidence of the efficiency of this machine. It tells all there is to tell about the economy and the ability of the Brookville to deliver the goods

Do you want more evidence? We are able to furnish it

BROOKVILLE TRUCK & TRACTOR COMPANY, Brookville, Pa., U. S. A.

A. J. Alsdorf Corp., 404 South Wells Street, Chicago
Foreign Distributors

A. R. Woolridge Co., 220 King Street, West, Toronto
Canadian Distributors

THE handling of sand and gravel demands that type of equipment which will withstand the excessive wear and tear characteristic of these materials.

Webster equipment is built to meet the exacting demands of this service. Each part is ruggedly built as well as accurately designed to give long life with low upkeep and maintenance costs.

Our Engineers have specialized in this work and are qualified to recommend suitable equipment to meet your needs. Every Webster plant is designed to produce a high grade product which will secure preference in the market. This is true of the smallest as well as the largest of Webster plants.

If you are considering the building of a new plant or changes in your present equipment, talk over your plans with our engineers; they are at your service.

THE WEBSTER MFG. COMPANY

4500-4560 CORTLAND ST., CHICAGO

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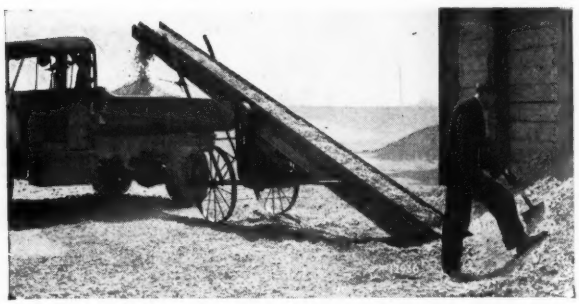
The rugged construction of the Radial Loader especially adapts it to severe and rough service

Note how the digger edge buckets dig themselves into a pile of material and take a full load without the aid of shovels or mechanical devices

Keep the Trucks Moving With a Jeffrey Loader



The Jeffrey Portable Belt Conveyor
meets the demands for a light, durable and inexpensive conveyor for loading and unloading Sand, Gravel, Crushed Stone, Coal, Coke, Cinders, etc. Capacity from 20 to 50 tons per hour.

Write for Catalog No. 369-F

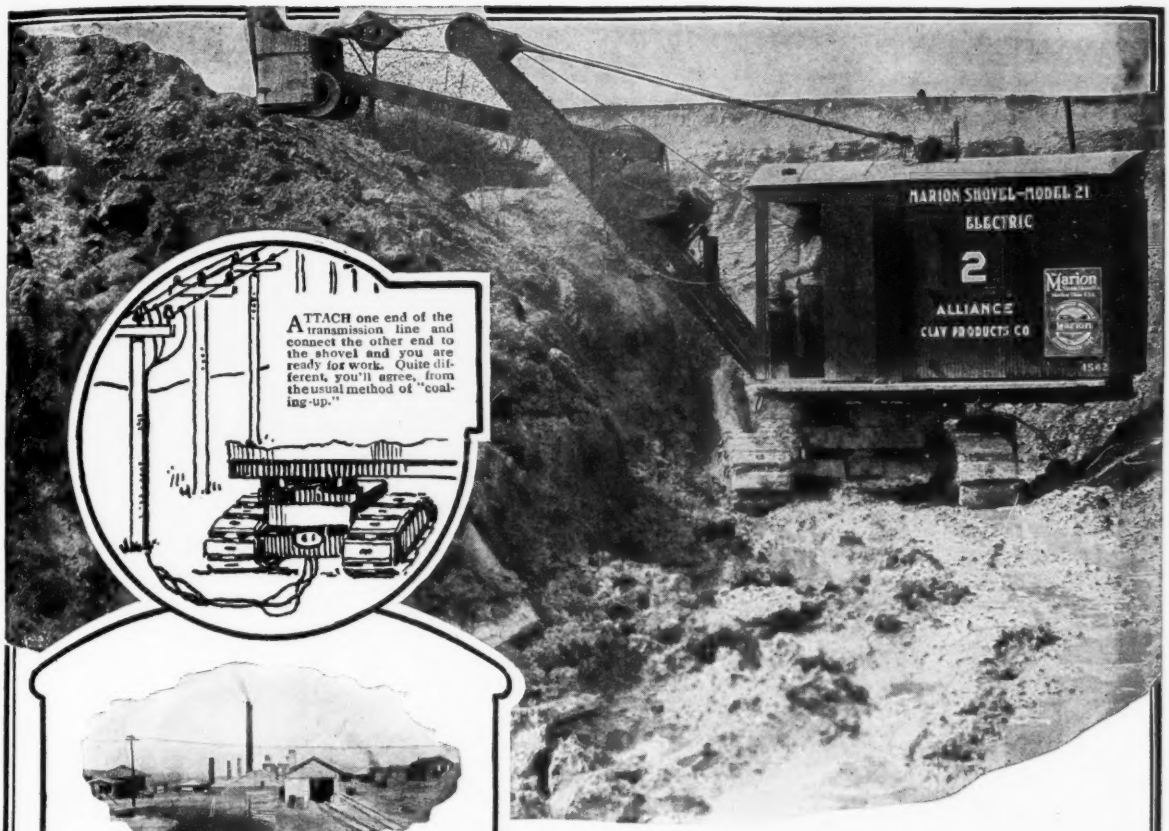
CONSTRUCTION work can't be delayed by truck hold-ups. Material must get to the job on time, and with the least possible expense and labor.

Where large quantities of material is to be handled rapidly, there's no truck hold-up with a Jeffrey Radial Loader with a capacity of 1½ to 2 cubic yards per minute of sand, gravel, crushed stone, and similar materials. One unskilled laborer operates it. You can easily figure the savings it will effect for you.

The Jeffrey Radial Loader is fully illustrated and described in Catalog No. 309-H.

The Jeffrey Mfg. Co. 935-99 NORTH FOURTH STREET Columbus, Ohio

JEFFREY
MATERIAL HANDLING MACHINERY



A Most Satisfactory Piece of Equipment

"We wish to express the satisfaction that we are having in operating your Model 21 three motor electric shovel mounted on caterpillar tractor. We have been operating this shovel now for six weeks under the most trying circumstances in places so soft that the axles would shove the dirt in front of them. We have also been able to run it up grades of from 25 to 30%. It is certainly one of the most satisfactory pieces of equipment that we have had in our thirteen years of brick experience."

Alliance Clay Product Co.,
J. B. Wilson, Manager.

EVERYWHERE RELIABLE
The Marion Steam Shovel Co.
ESTABLISHED 1884

Where Fuel is Expensive or Difficult to Handle

Get a Shovel that "Takes Power from the Line"

There are many places where fuel is the most troublesome of all problems to solve. For instance—in wet, muddy cuts like the one shown above, and in mines, quarries or pits.

It is here that the new Marion Electric is the right shovel to buy.

You can use this shovel, and use it profitably, wherever electric current is available—either A. C. or D. C. More and more this is becoming an age of electricity, and the new Marion Electric brings the efficiency of electric operation into mechanical shoveling. Consider the convenience, and then figure for yourself the saving in daily cost. One man runs the shovel, no team is required handling fuel and water, no stopping to "coal up," no waiting on steam, none of the fuel problems so common on many jobs.

Before you buy your next shovel it will pay you to investigate this new Marion. If you haven't a copy of our Bulletin 301, illustrating and describing this new machine, just write and we'll send one promptly.

249

The Marion Steam Shovel Company
Marion Ohio.

Marion Crawler Trucks Make Hard Going Easy

"The rock, as it comes from our quarry, runs from 36" cubes to spalls and we crush from sixty to seventy-five tons per hour—consuming from 50 to 200 H.P. Seventy-five per cent of the rock is crushed to powder and twenty-five per cent to 1½" and smaller."—San Antonio Portland Cement Co., San Antonio, Texas.

"It is taking 36" cube stone and is being fed with a 48" Steel Pan Conveyor and this crusher breaks it to 1½" and finer with a minimum of fines, as we sell our limestone for macadam purposes."—John Herzog & Sons, Forest, Ohio.

This Williams Mammoth Crusher is breaking 36" stone to 1½" or finer, in one operation

Another Williams Mammoth is now going out to take the place of a jaw crusher and a number of gyratories, conveyors and elevators.

Another Williams Mammoth is going out to again prove that its 24 to 1 ratio reduction basis is the biggest factor in rock crushing economy that has come on the market in the last 20 years.

Here is a crusher so huge in size and capacity as to handle 3 foot stone, and so efficient in crushing as to reduce that stone to 1½" or finer, in one operation, eliminating intermediary crushers, elevators, screens and other equipment.

It is inevitable that wherever large scale rock crushing is done, the Williams Mammoth is certain to be installed sooner or later. It pays its cost so quickly after installation that a statement of the facts is hardly credible except from personal investigation.

The Williams Mammoth is a specially built to order machine, and the news of what it does is spreading so fast that it will pay anyone interested to take prompt action and place an order early. Write today for full information.

Williams Patent Crusher & Pulverizer Company

800 St. Louis Avenue, St. Louis, Mo., U. S. A.

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Rock Products

Volume XXV | Chicago July 15, 1922 | Number 14

A Crushing Plant for a Filter

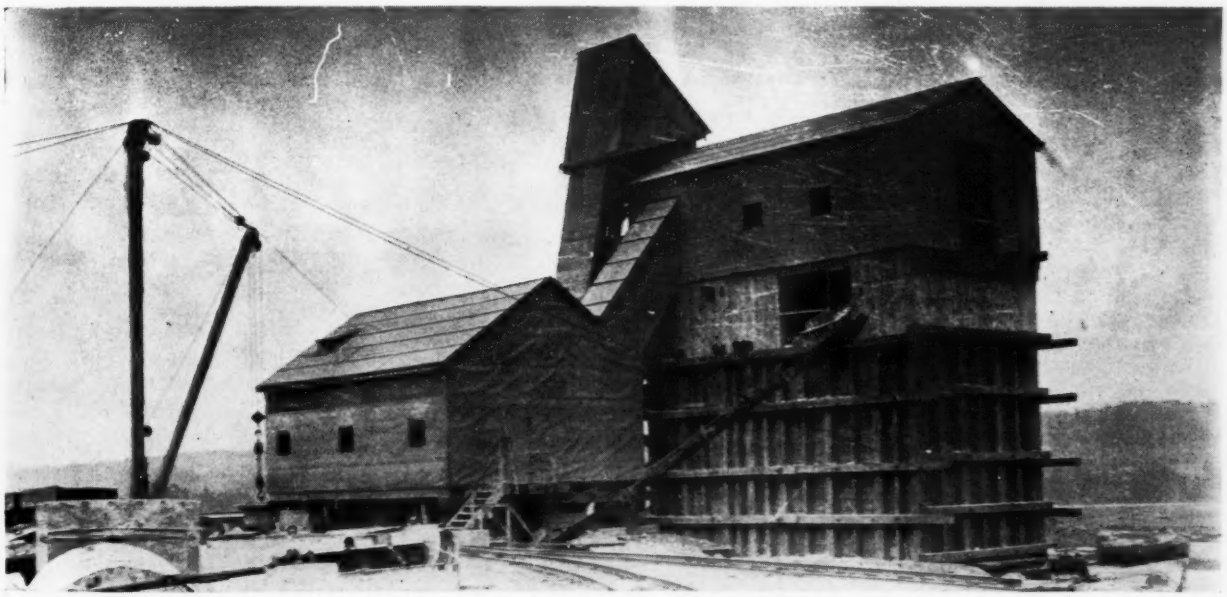
Here is a use for crushed stone which may be developed in many communities where stone can be supplied by commercial producers rather than by a municipal plant as in this case. This use offers a potential market for large quantities of stone

WITHIN an area of half a square mile the sewer department of the city of Worcester, Mass,, is placing more than 300,000 tons of crushed stone. To have purchased this quantity of stone from the nearest operating commercial plant would have meant a cost of $1.25 a ton for freight alone, and the freight charges for the job would have built several crushing plants capable of supplying all the stone needed for the job. With a supply of suitable stone within half a mile of the place where it is to be used, there could be only one way of answering the question of economical stone supply. The answer was to put in a crushing plant and open a quarry, and that is what the city of Worcester did.

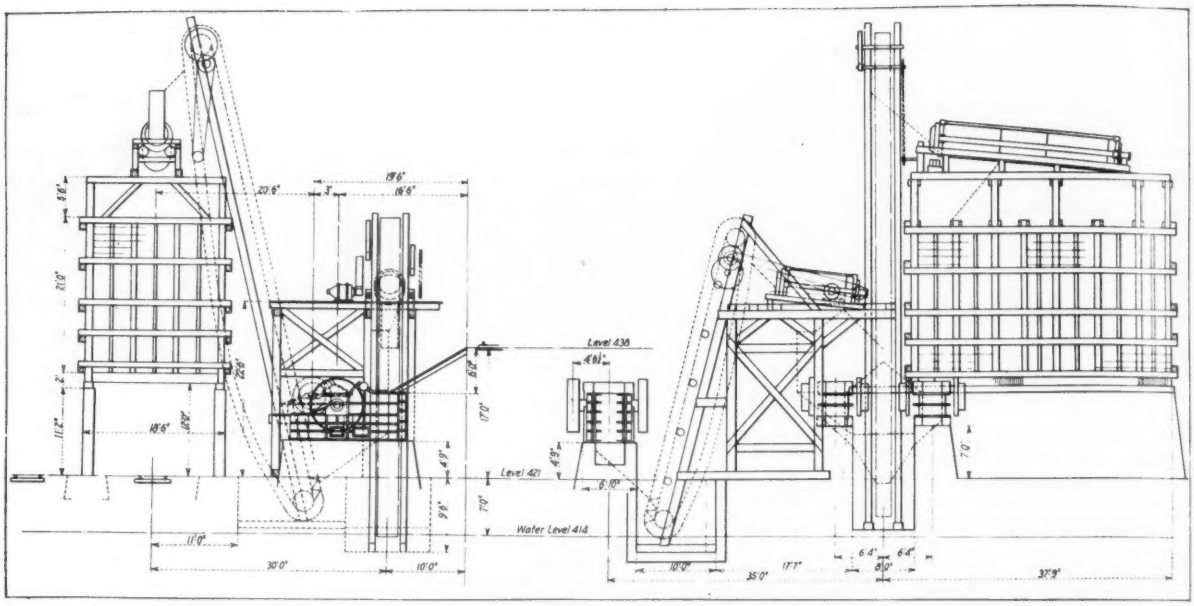
About two years will be required to complete the filters on which the stone is to be used, and whether the plant will be dismantled, or sold to a private operator, or otherwise disposed of after that time has not yet been determined. The entire cost of equipment can be written off on this single job, if necessary, and the city will still have saved money.

Conditions for this particular filter job, however, are unusual. The closest commercial quarries are 60 miles or more away, and one or two switching charges would have to be included in order to get the stone delivered at the plant. Under more favorable conditions a community could better purchase the stone from a commercial quarry and eliminate the expense and trouble of its own crushing plant. The development of filters of the type Worcester is installing should mean a good bit of business for the crushed stone operator located within shipping distance of the community where the filters are to be installed.

Worcester is one of the few inland cities which is not situated on a river or lake sufficiently large to take care of the sewage by dilution after proper treatment and precipitation. This condition requires filtration of the treated sewage, and Worcester is installing Imhoff tanks and trickling filters. For many other communities, even as small as 10,000 inhabitants,



This 500-ton-a-day crushing plant has been erected by the sewer department of the city of Worcester, Mass., because freight rates made commercial stone too expensive for the construction of a new filter. The one-story building contains the scalping screen, and below it are the three jaw crushers



Dumping to the crushers is accomplished without elevating. The secondary crushers are on the same level with the primary, and have been used for initial crushing when the larger crusher was down

a similar method is desirable and the development of these possibilities will open new markets for the crushed stone producers. Every producer where conditions make filters desirable has a potential market which he may be able to develop through publicity for such sewage treatment methods.

At Worcester, 72 acres of old sand filter beds take care of about 20 per cent of the treated sewage, and the rest is handled by chemical precipitation, using lime as a precipitant. The new sewage treatment plant will consist of 12 Imhoff tanks and 14 acres of trickling filters, the filters covered with 10 ft. of crushed stone. For the filters 300,000 tons of stone will be required, and the concrete construction in the filters, tanks and other parts of the plant will take nearly 50,000 tons more. The stone used passes the 3-in. ring and is retained on the 1⅛-in. ring.

The floor of the filter is of concrete 4 in. thick, on which are cast concrete sills 3 in. high, 15 in. on centers and 6 in. wide at the bottom and 3 in. at the top. Laid edgewise across these sills are beams 16x4x1½ in., alternating the rows with the beams resting loosely against each other where they overlap on the sills, giving a surface a little less than half of which consists of apertures 14 in. long and 1½ in. wide. On this the first layer of crushed stone is laid by hand to insure none of the smaller stone falling into the 1½ in. cracks. The stone is then spread over the bed to a depth of 10 ft., and the filter is ready to receive the effluent from the Imhoff tanks, which is distributed to the filter by sprinkler heads at frequent intervals in pipes laid over the filter. A 10-ft. concrete wall encloses the filter

Looking into the primary crusher from the dumping track

So much for the filter and what is required in the nature of crushed stone. Now for the plant which is producing the stone.

About half a mile from the filter site is a deposit of bastard granite which is accessible without much stripping. A quarry was opened up here, and 500 ft. away, on a side hill where the quarry cars can be dumped direct to the crushers without elevating, the crushing and screening plant was located. The plant, which was designed and erected under the supervision of the C. G. Buchanan Co., has a capacity of about 500 to 1000 tons daily.

Three Buchanan crushers, all on the same level, handle the crushing. The initial crusher is a 30x42 in. jaw type, and the two recrushers are 13x30 in. jaw crushers. The quarry cars are run along side the crushers, on the same level as that of the quarry floor, and side dumped into the stone box of the large crusher. The two smaller crushers can be used as initial

In the two lower corners are shown the secondary crushers between which oversize from the scalping and main screens is divided

crushers if necessary or desirable. Since they are on the same level as the larger one, and beside the tracks from the quarry, the operation is no different.

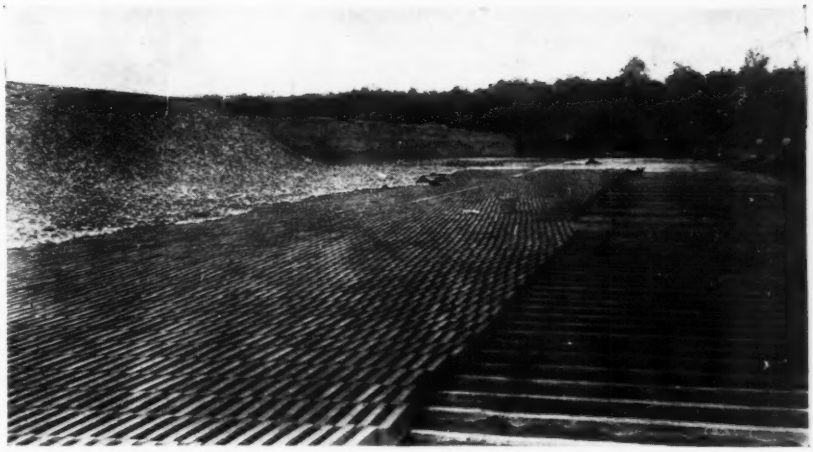
From the initial crusher an elevator carries the material to the scalping screen, which is 8 ft. long by 48 in. diameter. The oversize goes by gravity to the two recrushers, while the small material is elevated to the revolving screen at the top of the plant, a screen 22 ft. long by 48 in. in diameter, which furnishes three sizes of stone—1⅛ to 3 in. for the filters, ⅜ to 1⅛ in. for the concrete and below ⅜ in., which is used in the concrete and for making the 16 in. beams used in the floor of the filter bed.

The oversize from the main screen, as well as from the scalping screen, goes back to the secondary crushers by gravity chutes.

From the sizing screen the stone goes into the bins below, and a loading track under the bins makes loading easy. The stone is hauled in 4-yd. side dump cars to the filter and to the mixers for concrete work, both of which are approximately half a mile away. For the entire quarrying, crushing and filter construction work there are in use five 6-ton Cummings gasoline locomotives, four 9-ton Porter locomotives, 22 4-yd. Western side dump cars and 24 2-yd. Koppel cars.

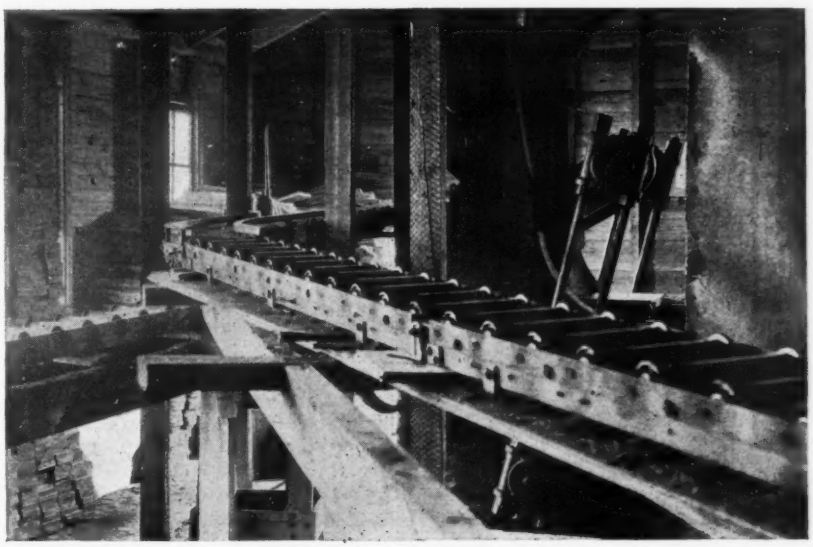
Beside the crushing plant is a concrete products plant where the 16 in. beams already described are made. These are molded from a 1 to 3 cement mortar, using the fines of the crushing plant for the aggregate, conveyed by gravity conveyor into the steam curing room, where they remain ordinarily for 36 hr. and then brought out ready to use on the filter bed floor.

With this three-size stone plant, where the principal product is the 1⅛ to 3 in. size, the two smaller sizes can be nearly used up in the concrete and the small beam construction which is part of the whole job. The sewer department plans to use practically the entire output of the plant during the period of construction of the Imhoff tanks and trickling filters. The future disposition of the plant had little effect on the determination in this case of the desirability of erecting a plant to supply the job with the necessary stone, and what to do with the plant after the filters are completed is still a problem for the future.



WHERE THE STONE IS USED

Here is part of the floor of the new 14-acre filter. On the beams the first layer of stone is hand laid, then stone 1⅛ to 3 in. is dumped on to a depth of 10 ft.



Nearly 2,000,000 beams 16x4x1½ in. are needed in the filter. In the building shown above, the beams are made of 1 to 3 cement mortar, and this at the same time uses up the fines from the crushing plant. The lower illustration shows the concrete brick machine which makes the beams and the gravity conveyors from machine to curing room

A New Calciner

THE Niagara Gypsum Co., located at Oakfield, N. Y., not long ago added a second 110-ft. rotary calciner. Gypsum at this plant has been calcined successfully in the single rotary kiln for several years.

Putting New Jersey's Potash Marls on a Paying Basis

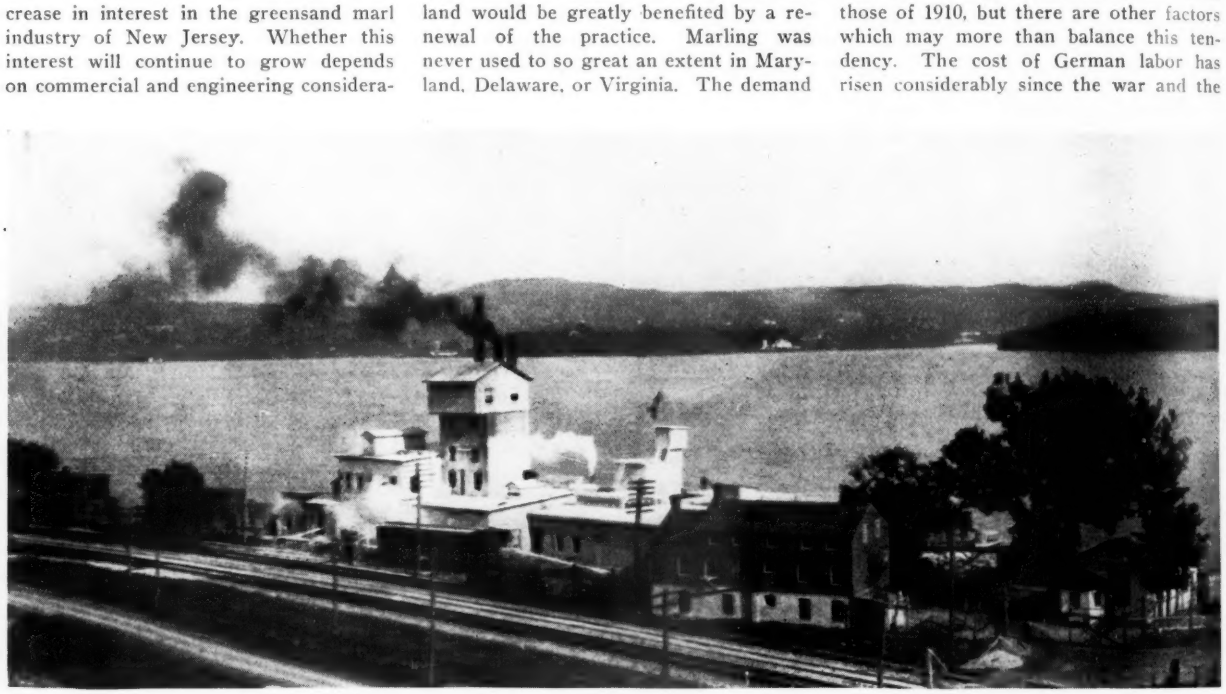
By John H. Ruckman
Consulting Geologist and Engineer

In this second article some of the commercial and engineering considerations in the development of New Jersey marls are taken up

IN the preceding article it was stated that there has been a considerable increase in interest in the greensand marl industry of New Jersey. Whether this interest will continue to grow depends on commercial and engineering considerations, that is to say on the market for the material and on the cost of production. As has been pointed out, the marls are valuable both as fertilizers and as possible sources for the soluble salts of potash. The problem is a complex one and cannot be fully discussed here; the main factors in the situation may, however, be indicated.

The market for the marl or its products is dependent on domestic demand for potash and on foreign competition. Freight charges limit the territory in which marl may be used as a fertilizer to the Atlantic coastal plain. The soil of New Jersey was for many years over-supplied with potash; for the last 40 years, however, little "marling" has been done and it seems safe to assume that much of the land would be greatly benefited by a renewal of the practice. Marling was never used to so great an extent in Maryland, Delaware, or Virginia. The demand for soluble potash salts is not limited to New Jersey or the coastal plain, and is in normal times likely to equal or exceed the supply. In either case the chief competition may be expected from soluble potash salts of German origin.

At the present time the salt most used in agriculture and the arts (potassium muriate 80 per cent pure) is quoted at $35 a ton, f.o.b. Atlantic ports. During the war the price was at one time $350 a ton and there was little or none to be had at that figure. On the other hand, in 1910 when the trade with Germany was at its height certain German firms were shipping potassium muriate to Atlantic ports at $32.98 per long ton and were able to make a profit. What may occur in the future is hard to predict. The present state of German exchange would seem to point to lower prices than those of 1910, but there are other factors which may more than balance this tendency. The cost of German labor has risen considerably since the war and the individual production has been lowered. Germany has also undertaken many enterprises of a more or less socialistic nature which are increasing taxes. In addition to these she has heavy indemnities to pay, which must in the long run be met by taxes on her industries. Previous to the war German export trade was aided by numerous subsidies which it seems very unlikely she can maintain under the new conditions; indeed it seems possible that that nation is today near bankruptcy. Finally, if her credit is again established the price of the mark will again increase. It is idle to endeavor to evaluate all of these factors, but it seems unlikely that as the world returns to normal the Germans will be able to place potassium muriate in New York in large



At this experimental plant at Jones Point, N. Y., the Charlton-Meadows process was tested and adapted to commercial production by the Eastern Potash Corporation

[1] *Journal of Agricultural Research*, December 2, 1918. Vol. 15, No. 9, pp. 483-492.

quantity at less than $30 a ton, and it seems highly probable that under new conditions the price will stabilize at a higher figure.

In considering the ability of the marl to compete as a fertilizer with soluble German salts, it is of course necessary to demonstrate that the potash in the marl is really available to the plant. As it is not soluble in water, this has been considered doubtful. In spite of the record of the material in the early days of New Jersey, there are authorities who question the availability of the potash in the marl and it was this doubt which was chiefly responsible for the failure of the industry to develop rapidly during the war. The matter at that time was of such importance that the United States Department of Agriculture undertook a series of experiments at the New Jersey Experiment Station conducted by R. H. True and F. W. Geise,[1] but unfortunately the tests were not completed till after the close of the war. Marl was tried out as a source of potash for wheat and clover in competition with various salts commonly used for that purpose. Not only did the results show that the potash of the marls was as readily available as that of the salts, but it was found that the plants actually gave better yields, per pound of potash, when the latter was applied in the form of marl than when it was applied as muriate or sulphate of potash. Moreover it was demonstrated that the plants absorbed and made use of far greater quantities of potash when it was applied as marl, that they tolerated much heavier fertilization and gave results in some cases twice as high as the best obtainable with the commercial muriate.

Value of Marl as a Fertilizer

There are several explanations of this very gratifying and more or less unexpected result. While the potash of the marl is not soluble in water, it is apparently absorbed readily by the juices of the plant when needed; when not needed it is not absorbed and cannot thus poison the plant as the soluble salts undoubtedly do when applied in excess. It is also true that the marls used in the experiments carried appreciable quantities of phosphates and considerable iron, which is considered by some authorities as of value to the growing plant, but since these materials are constituents of practically all the greensand marls the comparison remains a fair one, particularly as phosphates were purposely supplied to all the plants in abundance in order to make the test rest on potash alone. It would appear then that the value of the marl as a fertilizer is at least equal to that of the potash it contains and that its money value may be computed on that basis. For "forcing" work in truck gardens the soluble salts may be better, but even in this case it is probable that the addition of lime or gypsum would free the potash of the marl fast enough for that purpose.

Inasmuch as the good marls run about 6 per cent potassium and commercial potassium muriate about 42 per cent potassium, it would seem that on the basis of these experiments good marl should be worth today a shade over $5 a ton. There are, however, two important factors to be considered, cost of transportation and cost of distribution. A ton of potassium in the form of marl weighs seven times as much as the same quantity in the form of muriate. At present rates it costs nearly seven times as much to send it by freight and seven times as much to apply to the land. As a result if the marl has to be transported to any great distance it cannot compete in price with the more concentrated product. For example, let us consider the cost of applying four tons of muriate or its equivalent in marl to a farm in central New Jersey. In the case of the muriate the cost is as follows:

Some Cost Figures

Purchase price $140, freight $8 to $14, haul three miles from depot $3, distribution on land $6, total $157 to $163. For marl the cost f.o.b. pit will be about $2 per ton or for 28 tons $56, hauling three miles will be $21, distribution by hand $42. If distribution is made by a lime spreader of the Van Brunt or similar type, the last item is only about $20. Accordingly if it is not necessary to ship by rail the total cost need be only $97, a saving of about $60. At present freight rates marl can be shipped to most points in New Jersey from the nearest pits at 10 cents per cwt. or $2 per ton. Practically all points can be reached for $3 a ton. In the former case the cost of marling the farm would be $153 in the latter $181, or considerably more than the cost of the imported salt. At present prices, therefore, marl should be able to compete on a cost basis in certain portions of the state, but not everywhere. If muriate continues to decline to $30, marl cannot compete except in the immediate vicinity of the pits. To permit the industry to revive, still lower freight rates are essential.

The reduction need not be very great. A rate of 2 cents per ton mile will enable marl, sold at $2 per ton f.o.b. nearest pit, to be placed anywhere within the State of New Jersey in competition with the imported salt, even with the latter at $30 a ton. Indeed competition should be on equal terms 70 miles from the marl pit. The sandy strip along the Atlantic Coast is made up of land of the type most benefitted, and marl pits which have access to salt water, by efficient use of canals and waterways already existing should be able to sell their product anywhere along the coast from Boston, Mass., to Beaufort, S. C. The necessary reduction in rail rates could probably be obtained if the railroads saw any great chance of increasing traffic by making the necessary reduction, but it is by no means certain that any great increase in traffic would result. This situation is due almost entirely to a single cause, that farmers throughout the United States have been taught to regard all potash not soluble in water as worthless. Every particle of German influence and scientific opinion has been and is still being used to hold them to this view. Within the last six months the writer received a letter from our own Department of Agriculture which stated that the potash in marl was worthless as a fertilizer, this despite the fact that carefully conducted experiments at its own stations had proven the contrary. As a matter of fact marl possesses certain advantages over the soluble salts. Perhaps the most important of these is the fact that since its potash content is insoluble in water no loss occurs from leaching and the effects of the material are visible for a number of years. The experiments of Messrs. True and Geise demonstrated that the potash of the marl was actually more efficacious than that of soluble compounds, and there can be little doubt that had the tests been arranged to cover a number of seasons under actual field conditions, even better results would have been obtained. At the present moment there is probably no single factor which would aid the industry more than further experiments by the Department of Agriculture which would serve to demonstrate the true value of the marl as a fertilizer and to dispel forever the belief that its potash is of no value because insoluble in water.

Importance of Rail Rates

The question of rail rates is nevertheless important. If the German interests are threatened, the selling price of muriate will be lowered, and under such conditions present rates will make it difficult if not impossible to compete, no matter how widespread the demand. Both education and lower rates are necessary. If the traffic can be re-established at anything like its past importance, no one will be more directly benefitted than the railroads.

The example selected in which the marl is compared with the concentrated salt is the most unfavorable case. While an increasing number of farmers purchase the raw materials and mix their own fertilizers, a majority still depend on ready mixed fertilizers of various types. Nearly all of these contain a so-called filler of inert material; most of them contain very large amounts of inert material; one authority of high standing has stated that

when several thousand ready mixed materials were analyzed it was found that on the average they contained 85 per cent filler.[3] Where such dilution of the real plant food occurs there can be no doubt of the ability of marl to compete. Even if the filler makes up only 50 per cent of the whole, if the price is maintained at $50 a ton, which is about the average for potash bearing fertilizers, it will be found that the cost of placing eight tons of such material on a farm at Harrisburg or Atlantic City will be $450; marl carrying an equal amount of potassium could be placed at the same price even though purchased in central New Jersey at a price of $8 a ton. As a matter of fact a certain amount is now being sold for shipment at $5 to $10 a ton, f.o.b. pit. As has been said, many fertilizers contain much more than 50 per cent filler. For example the writer recently noticed a material put up in attractive packages for use by amateur gardeners and country clubs with an imposing "guaranteed" chemical analysis in which only 7 per cent could, by any stretch of courtesy, be termed plant food. Yet it was retailing at 12½ cents per pound and was being readily bought. This material was superior to the marl only in a higher available phosphate content; in every other respect it was altogether inferior. It is interesting to note that at least one marl company has recently been making a serious effort to obtain the trade of country clubs and large estates and reports excellent business characterized by repeat orders.

Marl Ideal as an Inert "Base"

If it is proper to use an inert "base" for fertilizer, marl provides an ideal one. The average marl without counting iron, amorphous silica or lime, contains nearly 8 per cent of desirable substances and by increasing the available supply of nitrogen, phosphoric acid and sulphur, it can be converted into a product which if not perfect is nevertheless superior to many which have proved commercial successes.

In addition to the uses of the marl as a fertilizer, it has recently been found that certain of the deposits possess characteristics which render them valuable for other purposes. Perhaps the most important of these uses is as a filter in water treatment plants. For this purpose the physical nature of the marl is more important than its chemical analysis. It should be composed of even-sized rounded grains free of clay or other fine material. The beds in certain localities possess these characteristics in far greater degree than those of others; all however, can be considerably improved by mechanical treatment. For this purpose either screening, or separation by air or water current may be effective. The fine material when saved runs nearly as high in potash as the coarse and finds a ready market as a fertilizer while the coarser globular material is placed in sacks and shipped to water treatment plants. Within the last few months materials of this nature have been shipped in large quantity to Chicago and at least one consignment was shipped to England. The material is reported to be giving satisfaction and to be increasing in demand.

From the above it is evident that greensand marl today possesses a small but definite market. It is being purchased for special uses in connection with water treatment and is competing successfully with ready mixed fertilizers. Its most dangerous competitor, and the one which in the long run will determine whether or not the industry is to endure, is German potash. With this material the marl can compete within limited territory at present prices, but should the Germans again lower their prices to the 1910 standard, it will be very difficult if not impossible to obtain a market for the domestic product unless freight charges are reduced. It is also well to note that present successful competition has been made possible by the results of experiments carried out under the supervision of the Department of Agriculture. Further experiments along the same line, if successful, will do more than anything else to bring the true value of greensand marl before the consumer and aid in marketing it in competition with imported potash.

Cost of Excavation and Treatment

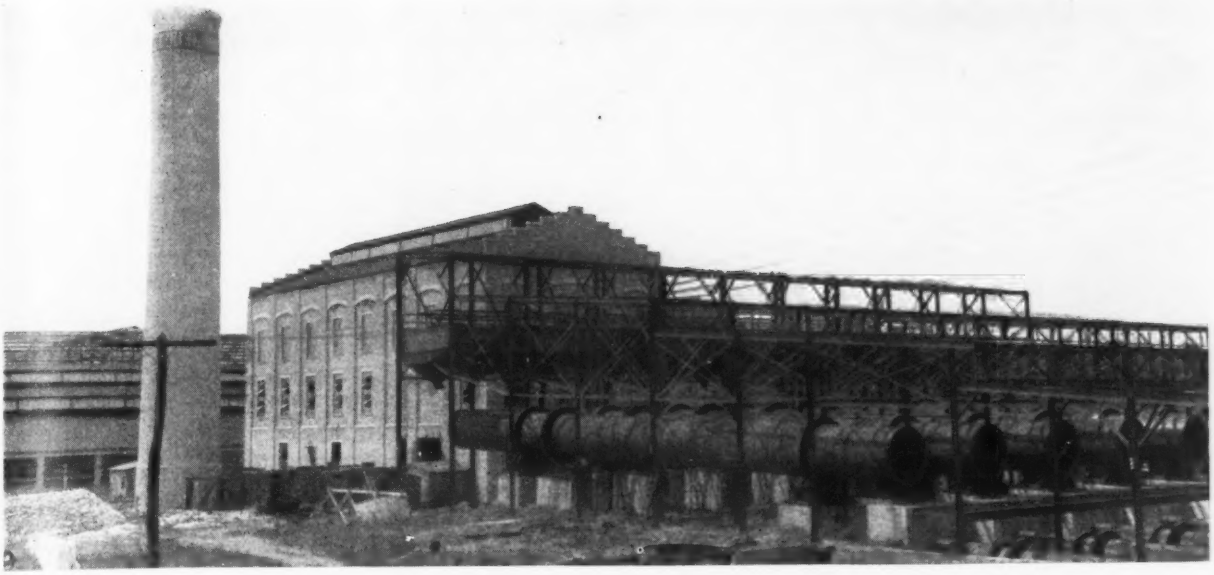
As compared with freight and cost of distribution, the cost of excavation and treatment of the marl is a relatively unimportant factor. It is always low when compared with the other charges and is important chiefly as it affects competition between rival pits. The marl itself is a tough material which can be dug with somewhat greater facility than common brick clay. It is rarely free of overburden of some sort though this is sometimes so thin as to give little trouble. Where no other bed overlies it the upper portion of the marl itself is generally poor in potash and of little value, so that this portion has to be stripped.

More generally it is overlain by beds of Quarternary sands and gravels, sometimes of great thickness. In certain cases these materials are now being worked to supply Philadelphia with gravel, but it is only rarely that this is itself a profitable enterprise. As the marl beds dip to the eastward they finally pass under clays and sands of Miocene age. The latter thicken at a rate of about 30 feet to the mile so that even where there are no Quarternary gravels the marl is soon buried too deep for excavation. Removal of the overburden is by no means the only factor in excavating cost. One of the most serious is the problem presented by water. The Quarternary gravels above and the Cretaceous sands beneath are both water laden. The water from above generally occurs at or near the drainage level of the surrounding country and gives little trouble. The water in the sands below, on the contrary, is under considerable hydrostatic head and when it is tapped serious results follow; instances are recorded in which an entire quarry has been flooded from this source in the space of six hours. The supply on such occasions appears almost inexhaustible and has proved very difficult to control by pumps. The marl is generally more resistant to erosion than the beds above; as a result, except along the western edge of the marl belt, the streams generally find their level at the top of the marl. This complicates matters somewhat since it may be necessary to protect the pits from over-flowing streams. To the westward this situation is not encountered and it is possible to select points at which natural drainage may be obtained, an advantage which is partially offset by the thinning of the beds in this direction. It is also possible to select locations at which the marl is entirely below ground water level and where by a low dam the quarry site can be rendered suitable for operation by dredge. At certain points the upper surface of the marl is capped by a bed of shells which is almost as hard as solid limestone. Lenses and stingers of the same material are frequently encountered. These give little trouble except where an attempt is made to operate under water, when it is difficult to select machinery which will carry the work through in an efficient manner. Where the marl is exceptionally free of fine material, it is itself charged with artesian water and under such conditions dry excavation is out of the question. Certain streaks of marl carry considerable percentages of sulphuric acid and as a result are unsuitable for fertilizer unless mixed with lime. These streaks are known as "poison marls" and when present are generally treated as waste. All of these difficulties are common to most quarry work, and all of them can be remedied by simple engineering measures. Most of the pits operating today are working on small scale only and under the most advantageous conditions. It will be difficult to obtain equally good conditions for large scale enterprises but the savings accruing from large production (provided such production can be marketed) will more than compensate.

That Time-Honored Method of Excavation

The time honored method of excavating marl is by hand. Under present conditions of small productions, it is the most efficient method. The common procedure

[3] Edw. B. Vorhees. U. S. Dept. Agr. Bull. 44. 1906.



WHERE THE CHARLTON-MEADOWS PROCESS WILL BE USED

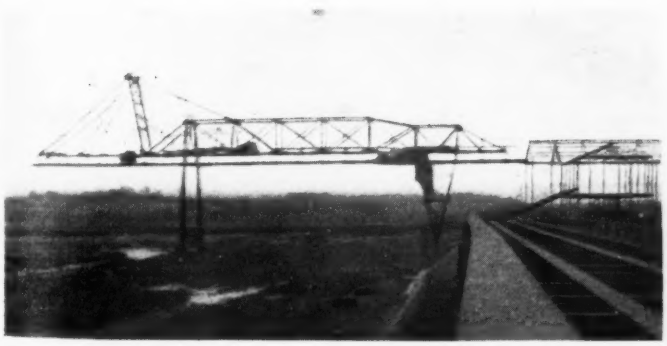
Here are the power plant, machine shop and partly completed kiln and cooler installation at the Raritan River plant of the Eastern Potash Corporation. The brick from which the buildings shown in the illustration were built were produced by the semi-commercial experimental plant

Preparing Marl for Market

In the next issue three types of marl and potash extraction plants will be described and illustrated by existing plants. These four views show a little of two operations in New Jersey where the greensand marls are being turned into a commercial product.

Courtesy Mr. R. Norris Shreve

This is the central group of buildings at the Eastern Potash Corporation's plant where it is planned to use the Charlton process



BRIDGE CRANE AND STORAGE FOR GREENSAND AND LIMESTONE

To the left can be seen a canal connecting the Eastern Potash Corporation's plant with the Raritan river. To the right lies the railroad trestle

THE AMERICAN POTASH-MARL COMPANY'S PLANT

The ponds in the foreground have been caused by the inflow of water from below into the pits in which excavation was originally attempted

is to open a trench through the overburden lifting the spoil out by means of a horse operated derrick or carting it up an incline at the end of the trench. When the overburden has been removed the marl is gotten out in the same way. During this phase of the work it is generally necessary to pump, and care is taken to cease work before the lower stratum of marl is penetrated, in order to avoid artesian water. When the first trench has been cleared, the shovelers move over and begin shoveling the next strip of overburden into the trench from which the marl has just been excavated; the marl is then removed as before. In the course of the operation a certain amount of marl becomes mixed with the sand and gravel and the terrain left behind the pit as it proceeds will generally be found a rather ill-drained meadow of great fertility. This method is well adapted to the needs of the farmer who digs his own marl and was standard practice in the earlier days. About 1870 some of the large concerns operating at that time laid railway siding directly into the pits, but otherwise the procedure differed little from that of the small enterprises.

Where Mechanical Excavation Was Used

The only record of successful mechanical excavation during the earlier days was that of a dredging outfit which operated near Woodstown. This machine is reported to have drawn two feet of water and to have had a crew of four men. Power was supplied by a 16 horsepower engine. It excavated and loaded on cars from 250 to 300 tons per day. It was well known at the time that its owners had the lowest excavating costs of any concern then operating, though there is said to have been some complaining that the product was slightly mixed with sand.

As a matter of fact this method cannot be bettered where conditions are favorable and where the market warrants a large production. Several other methods have been tried, particularly in one locality where the marl itself carries water. At this particular place the marl is capped by from 8 to 10 ft. of shelly limestone, which forms the surface of the ground.

The ground water level is only about 2 ft. below the surface. The quarry was opened by hand and everything went well until the limestone was penetrated whereupon the pit filled with water. A 70-ton dragline excavator was installed on the edge of the pond thus created, and for a time an excellent production was maintained. As the marl was excavated the wash of the water in the pit undermined the limestone which finally began to give way. The excavator narrowly escaped falling into the pit on several occasions and the method had to be abandoned. A tower and cableway outfit was then tried without success. A 5-ton grab bucket was used but it was unable to get a grip on the marl, and the cableway was abandoned. Finally a well was driven through the limestone from which water carrying a considerable quantity of marl was pumped by air lift. As proper equipment was not at hand something had to be extemporized and much ingenuity was displayed. In the absence of an air compressor an old Corliss engine was obtained. There being no other source of power a farm gasoline tractor was borrowed. The band wheel of the latter was belted to the old engine which was then driven backwards causing it to do service as a compressor. The results obtained were so satisfactory that a large oil engine and compressor have since been installed. Although temporarily successful this method is subject to grave objections.

It is very expensive; it can never recover more than a fraction of the marl; worst of all after a certain amount of the marl has been extracted, the limestone is almost certain to give way again causing a variety of difficulties. It seems probable that with the development of the industry excavation practice will standardize on three methods; for small production in dry pits, by hand, the spoil being removed by team, by horse or gasoline driven derrick or by gasoline driven elevator of the "wagonloader" type; for large production in dry pits, the revolving steam shovel, and narrow or standard gage railroad equipment; for large production under wet condition the dredge, either dipper or ladder or suction. Small production under wet conditions seems at present impracticable. The best conditions for large production exist where the pit can be kept entirely dry or entirely flooded, and where the marl beds lie in a continuous thick stratum unbroken by limestone stringers. Of course the less overburden present the better, and it is also important that the proposed site be crossed by a minimum number of highways which might hamper the action of shovel or dredge.

Marl a "Potash Ore"

So far the value and possibilities of the marl have been discussed only in relation to the raw material. The most interesting possibilities of the greensand lie not in its value as such but in the fact that it is so to speak a potash ore. In other words there is a possibility of producing soluble potash salts from the greensand at a cost which will enable these salts to compete on favorable terms with the present imported product. The best greensands run about 7.5 per cent potash, and this in soluble form is worth from $70 to $150 a ton according to the manner in which it is combined. Lead which is at present worth $90 or so a ton, can be successfully recovered from ore running as low as 5 per cent lead, although for success it is necessary that a valuable by-product such as silver be produced. There is, therefore, nothing fantastic about the idea of extracting the potash from the greensand marls. The chief reason why it was not attempted many years ago was the fact that it was generally believed that glauconite was a silicate and would prove as difficult to break up as feldspar. Orthoclase feldspar sometimes contains as high as 16 per cent potash and much labor has been expended in devising methods of making this potash available. Orthoclase has several characteristics which render it very unsuitable for an ore. First, it is almost impossible to find any really large deposits except so mixed with other minerals as to greatly lower the percentage of potash present. Second, the purer the mineral the larger as a rule are the individual crystals and this means expensive crushing machinery. Last and not the least important, orthoclase generally occurs with other minerals carrying soda and sometimes boron; compounds of either of these substances if present in any quantity will greatly reduce the value of the product. For all of these reasons glauconite which is soft and easily broken down by chemical reagents is superior to orthoclase as a source of potash.

It has long been known that glauconite could be broken up by various reagents and that on roasting it underwent important changes, its color being altered from dark green to a yellowish red. It seems to have been only under the unusual conditions brought about by the recent war, however, that any serious effort was made to take advantage of these properties. Potash (K_2O) was selling at that time in the neighborhood of $700 a ton, at which price a ton of greensand carried a value of $40, an amount which justified very extensive treatment, and it would seem that had any one of several processes for extraction which were subsequently tried been in commercial operation at that time, it would have proved most profitable. The attempt to make use of the marl, however, was made rather late in the day. The fact that nearly all of the processes developed demanded large and expensive plants caused further delay which was increased by the reluctance of capital to risk large investments to take advantage of a market condition which was known to be temporary. In any case before the extraction companies could perfect their processes and begin quantity production the market declined to such an extent as to alter the entire problem. Today the value of potash (K_2O) is much nearer $70 per ton; if the K_2O extraction amounts to 6.25 per cent of the greensand it is clear that a ton of the marl carries a value of only $4.375. Hence the problem has become

difficult and experience has demonstrated pretty conclusively that profitable extraction is impossible without the development of a valuable byproduct.

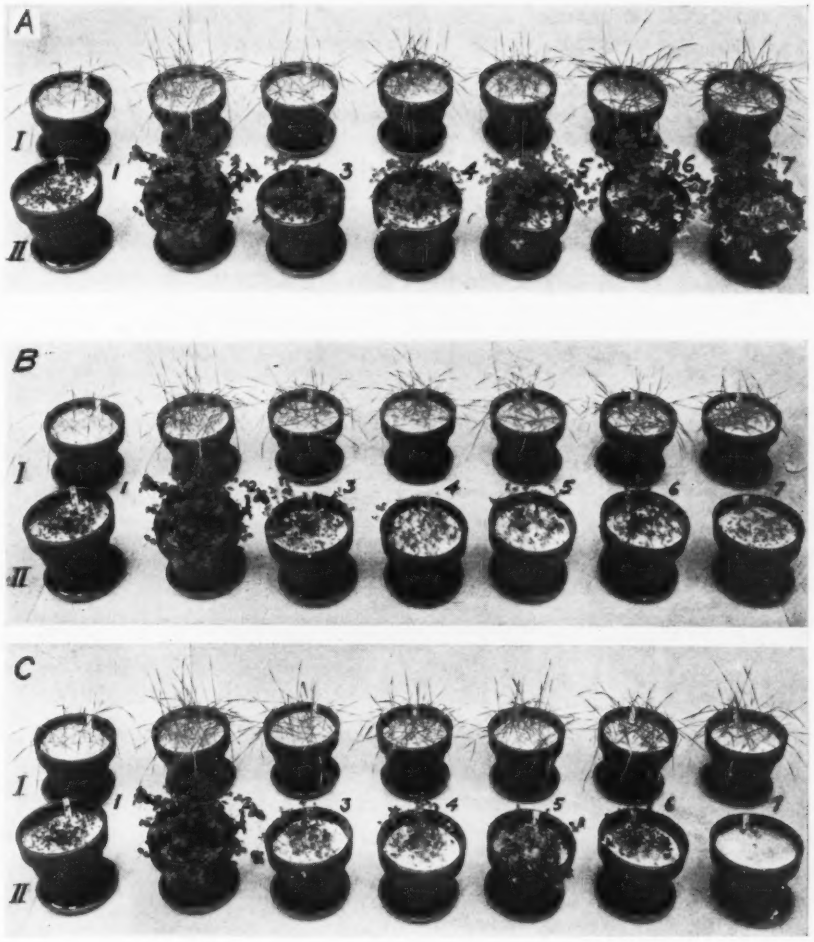
Potash as a Byproduct

Potash has been profitably recovered as a byproduct of cement manufacture and it would therefore seem that cement should form a suitable byproduct for the extraction of potash from marl. Unfortunately the greensand marls of New Jersey have little in common with the cement marls of the Middle West. As will be seen in the analyses given in the previous article the New Jersey marls are almost devoid of lime and are somewhat low in alumina. Nevertheless if large deposits of limestone occurred in close proximity to the marl beds it would seem quite possible that a very fair cement could be made using the marl as the clay-iron constituent. During the war the greensand was actually used for this purpose by the Coplay Cement Company, of Coplay, Penn. It is understood that a good recovery of potash was attained and that the quality of cement produced was quite up to standard. This took place, however, when potash was worth $700 a ton. Even then no very large production was attained.

At present the manufacture of cement from greensand and the recovery of potash appears impracticable, although with potassium muriate at $80 a ton, which was the price a year ago, there was an ample margin of profit. The nearest limestones suitable for cement are those of the Jacksonburg (Trenton), series which outcrop from Sussex, N. J., to Easton, Pa., in a belt nearly parallel to the marl district and 50 miles northwest of it. The marl itself is poorly adapted to cement manufacture, being so high in silica as to require five parts of limestone to one of marl in the "batch." The marl may be shipped to the limestone district or the limestone to the marl. In the former case, freight amounting to $20 per ton of potash is involved, which is chargeable directly against the cost of extraction. In the latter case a charge of $100 per ton of potash would be involved, but this charge would be largely—though not entirely—balanced by others. Thus competing companies must ship much of their finished cement to market at New York or Philadelphia. Shipments must be made by box car and a heavy freight rate charged. The limestone can command the cheapest possible rate, but 2500 lb., must be carried for every ton of finished product. Fuel is more expensive in the marl belt than in the limestone district. The finished product must still make a short journey by water to market. The net result is that no matter how the plant is arranged there remains a certain charge against it as compared with other cement plants, which must be made good from profits obtained by potash extraction.

The cost of precipitation and purification of the potash is far from negligible. The precipitation apparatus represents a large capital investment. The material recovered contains a high percentage of potash, but it is present as sulphate, chloride and carbonate, and is associated with other soluble salts, notably those of sodium. The purification of this material involves very heavy costs, in fact with kilns using batches containing the usual percentage of potash, the method is hardly profitable at present, if considered purely from the point of view of potash recovery. As the proportion of greensand must be small it is impossible to greatly increase the potash content of the batch, and it seems unlikely that the precipitation process at present prices, offers sufficient inducement for the investment of capital in plants specially designed to extract potash from greensand. Should potash prices again rise to the level of January, 1921, the process should prove practicable and profitable.

Another process which was tried during the war consisted of heating marl to 350 deg. C., mixing it with calcium chloride heating the mixture to 850 deg. C., and leaching the clinker thus produced. At first glance this process seems to possess some points of merit. The



Experiments have shown that greensand marl has a high fertilizing value. The illustrations at the left show how it compares with potash fertilizers supplied in the form of the muriate and the sulphate, from the results of experiments conducted by Messrs. True and Geise of the U. S. Department of Agriculture. In the upper illustration, No. 1 shows red clover and wheat growing in a soil devoid of potash. No. 2 shows the same plants in a soil supplied with all necessary plant foods in the best possible proportions. The other five pots are the same as No. 2 except that the potash has been supplied as marl, at 1 ton to the acre in No. 3; 5 tons to the acre in No. 4; 10 tons to the acre in No. 5; 20 tons to the acre in No. 6; and 30 tons to the acre in No. 7.

In the second illustration, B, the potash has been supplied in Nos. 3 to 7 as potassium muriate in the same quantities as in A; and in the lower illustration, C, the potash has been supplied as potassium sulphate in the same quantities.

most important is the fact that the amount of calcium chloride necessary is small, but the cost of this material plus freight, per ton of potash to be extracted, is about $40. This leaves only $30 to cover cost of excavation, roasting, and leaching of 16 tons of ore and salt. The clinker is unfortunately very hard and tough, impossible to leach without fine grinding and yielding a very low return in potash after such treatment. Another very serious drawback is the fact that no byproduct is formed for which any use has as yet been found. The process may yet develop but many very serious difficulties must first be overcome.

An attempt was made in 1918 to smelt the marl with lime, with the intention of leaching potash from the residue. A rotary cement kiln was used and a high temperature maintained. No precipitation apparatus was provided and as a result the attempt proved a complete failure, even at war time prices. At least 90 per cent of the potash must have escaped as fume.

The Charlton Process

Of the various methods which were tried, none has attracted greater attention than the so-called Charlton or Charlton-Meadows process. Its principal features were first outlined by H. W. Charlton in a paper read before the Boston sections of the American Chemical Society and later published in the *Journal of Industrial and Engineering Chemistry*.[3] In this process advantage is taken of the affinity of lime for silica at high temperatures and of the ability of water to aid chemical reactions. As originally announced the scheme contemplated the mixture of a given quantity of greensand with an equal amount of lime and about 10 times the same amount of water. This slurry was then passed into drums where it was subjected to a pressure of 225 lb. per sq. in., and a temperature of 390 deg. F. for from two to four hours. At this pressure the water remains in a liquid state and the postash of the glauconite is transformed into caustic potash. After removal from the digesters the liquor is filtered off and concentrated to commercial caustic potash. The unique feature of the process lies in the utilization of the residuum. This filter cake contains certain amounts of calcium silicates and as a result it has the power to harden and possesses the ability to act as a cement. Mr. Charlton therefore proposed to utilize this material as the cementing element for sand-lime brick manufacture, estimating that the filter cake produced in the extractions of 100 pounds of potash (K_2O) would provide binder for 20,000 sand-lime brick. The process possesses the advantage of not requiring a very high temperature for its reactions and of doing away with the necessity for electrical or other precipitators. Its greatest merit, however, lies in the production of a marketable byproduct. Indeed, Mr. Charlton, in his original paper, laid stress on the fact that no method could be expected to succeed commercially which did not produce a byproduct of value.

This scheme also possesses drawbacks. As has been shown there is no adequate source of limestone near the greensand deposits, and the freight charges involved in shipping the lime and marl to the best plant locations, amount in this instance to about $20 per ton of potash produced. Another difficulty lies in the great amount of water to be evaporated, but this can be minimized by the use of multiple effect evaporators, which subsequent experiments have demonstrated that a smaller amount can be used than was at first considered necessary. Finally the very amount of byproduct produced is a serious drawback. Till recently there has been little demand for sand-lime brick in New Jersey, while there is a well developed common brick industry which produces yearly from 150,000,000 to 300,000,000. An equal amount would be produced as the byproduct from a plant with a capacity of only 5000 lb. of potash (K_2O) per day using the Charlton-Meadows process as originally announced. As a matter of fact in the plant which is now being erected for the application of this process, it is proposed to use a much higher proportion of residue to sand in the manufacture of the brick, thereby insuring a smaller quantity of product of better quality, and it will also be necessary to market a large quantity of residue as agricultural lime. Even with these modifications the disposal of this waste material is a most important factor in determining whether or not the project will succeed.

The problem remains much the same no matter what process is adopted. The greensand runs at best a little over 7 per cent potash and an extraction of 6.25 per cent would be an excellent average by any of the processes as yet tested. This means that for every ton of refined product 16 tons of ore must be treated, and in addition other materials, lime, limestone, or calcium chloride, and fuel, must be transported and handled. If the necessary raw materials occurred in close proximity to one another it seems probable that at present prices, and granted adequate capital and sound management, extraction would prove a commercial success by any one of several methods. Unfortunately this is not the case and it is necessary to transport the raw materials considerable distances by common carriers, which are obliged to charge heavily for their services. If marl with higher percentages of potash can be located these difficulties will be greatly lessened, as will also be the case if more efficient methods of extraction can be devised; anything which will diminish the amount of worthless material to be treated per ton of product will aid.

Disposal of Byproduct

Another matter which is vital to the success of an extraction plant is the disposal of any byproduct produced. In this connection it cannot be too strongly emphasized that the smaller the amount of byproduct to be marketed the better. For instance, the large plant which is now being erected to apply the Charlton-Meadows process could produce sufficient binder for 8,000,000 brick per day. This plant is described in the concluding article of this series. The production of any such amount could have no other effect than to destroy its own market. There are of course certain advantages in having a considerable amount of income derived from byproducts. The market for potash salts has suffered severe fluctuations in the last few years and is largely controlled by foreign interests hostile to the development of American industry. Under such circumstances the sale of a byproduct, the value of which will depend not on the potash market but upon conditions in the local construction and agricultural industries, offers a very appreciable factor of safety. It should not be forgotten, however, that the primary value of the greensand marl lies in its potash content and the success of any extraction scheme must in the long run turn upon the ability of its backers to market the potash produced. With potassium muriate selling at $80 a ton, as was the case a year ago, potash extraction from greensand should have been a profitable operation. Today with muriate at $35 a ton and with a tendency to decline further it is proving a much more difficult problem.

[3] *Journal of Industrial and Engineering Chemistry*. Vol. 10, No. 1, January 1, 1918, p. 6.

Rail Lines to Ask for Rate Reduction

INDIANA intrastate freight rates on both steam and electric lines will drop after July 1 to the interstate steam line level established by the Interstate Commerce Commission in its recent 10 per cent freight rate reduction order. Petitions are on file from virtually every electric and steam road asking for this reduction. The petitions are granted without formal action by the commission. The steam lines accept intrastate rates on cement and on coal shipped less than 30 miles, according to John W. McCardle, chairman of the commission. He said, however, that conferences are on to determine whether the cement rates also shall not be reduced. The coal rates were not increased before the reduction and they may stand, he said.

Car Shortage is Imperiling the Rock Products Industry

Conditions affecting a car shortage should be made known to every producer at once and means taken to move immediately all supplies needed during the remainder of the season

IN keeping with ROCK PRODUCTS' main purpose of serving the industry in all of the vital things, the strict attention of every producer is called to the present car shortage and the perils attendant upon such a shortage just at a time when building construction and its kindred interests are beginning to so develop that business is once more gaining in volume and is in a fair way to become stabilized.

It is trite, but nevertheless true, that a serious car shortage today will work a severe hardship in the industry. It is equally true that if every producer in the field does not do his best to avoid this shortage, with all the means within his power, the healthy business he is about to enjoy will be disrupted to his exceeding detriment.

There are some questions which have a more or less direct bearing on the car-shortage situation that are without our jurisdiction, as the strikes of the railroad employes and the coal miners. As the situation stands at present, however, the coal strike is still problematical. If a settlement is not reached soon it is said that the President will intervene. This action will apparently open up two courses which the government can take. It can use the authority of the Interstate Commerce Commission to mobilize the transportation machinery for prompt movement, and the priority privilege if necessary. Or the President may appoint a commission to investigate the situation, depending upon public opinion to enforce the Commission's report. Or Congress may pass legislation empowering the President to seize and operate the mines.

(At this time of going to press the Washington dispatches announce that President Harding has issued an official proclamation designed to prevent interference with the transportation of the mails and interruption of interstate commerce by the striking shop crafts and their sympathizers. Maintenance of interstate commerce and mail transportation must go on, declares the proclamation, irrespective of employes' troubles and men must be supplied to do the work.)

The car shortage may also be influenced by the lack of motive power caused by the shopmen's strike, declares a statement recently made by the Indiana Sand and Gravel Producers' Association. Every day that these two strikes continue, says this statement, increases the car shortage later in the season. This association is keeping in close touch with conditions.

Three Vital Factors of Safety Against Car Shortage

1. **Loading all cars to axle capacity**
2. **Prompt loading and unloading**
3. **Loading cars in the direction of the owning railroad**

During the Atlantic City meeting of the Portland Cement Association, on June 26, the Committee on Transportation called attention to the fact that the railways have not for the past eight years bought enough new cars to offset the natural loss from wear-outs and wrecks.

The business of the country is steadily improving so that allowing for the coal strike the movement now is equal to the peak of 1920. The percentage of bad-order cars is still greatly above the average, approximating 16 per cent instead of the normal of 6 per cent. The grain crop this year will probably be normal. Predictions from well-informed sources seem to indicate general expectations that the coal strike will be settled in August and thereafter the demand for coal will force all coal equipment into coal movement. The situation now is that the reported car surplus consists mostly of bad-order cars and as a practical matter we are already in some localities commencing to feel a shortage.

Realizing the possible serious car shortage impending, the committee suggests that the Portland Cement Association place in the hands of its members a statement of present and prospective conditions which may be passed along to the trade through various means at the disposal of the members. It was believed that the statement to the members would suggest strongly that the trade be warned to prepare for the shortage by moving at once supplies of cement and aggregate needed during the remainder of the season. It should strongly stress the desirability of

1—Loading all cars to axle capacity.

2—Prompt loading and unloading.

3—Loading cars in the direction of the owning railway.

This action, coming from the largest single industry in our field, reflects the seriousness of the present car-shortage conditions as viewed by this association in executive session.

The Portland Cement Association is paving the way for the other associations—for every rock products producer—to rigidly adopt and adhere to the three controlling factors of safety against car shortage by seeing to it that every car is loaded to its axle capacity; that all loading or unloading the cars in possession of the holders; that cars are loaded in the direction of the owning company that is most accessible to the plant.

Each association should at once write to each member and urge that he conform to these requirements for better car supply, and that he in turn should adopt every means possible that will make the consumer give his fullest co-operation.

There is no question that there are abuses and mis-uses of loading and unloading alone that are working great hardships, and the sooner these abuses are corrected, the sooner will the industry be better served in the matter of more nearly adequate car supply.

Teaching Safety to the Children

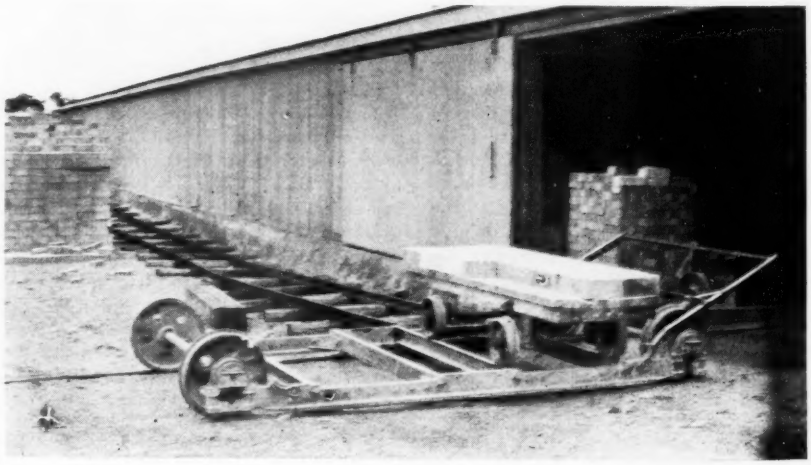
"I PLEDGE myself to help advance the cause of safety; to do all I can to prevent injury and death to my playmates and myself; to make myself my brother's keeper and thus decrease the amount of suffering, death, and sorrow in the world."

More than 1,200 school children of Portland, Ore., attending the second annual safety rally of the Portland Junior Safety Council, renewed this pledge which originated in their city.

A Way to Use Stone Screenings

Here is a plant which is successfully making brick from cement and quarry screenings at prices to compete with clay brick

A WASTE pile of fines—waste at least for the present and apparently for many years to come—is a common sight at a stone quarry. Markets have been developed at some places for the entire output of fines and at other places a part of this material ¼-in. and below can be sold, but still there are great piles of it at scores of quarries for which there is no present market and no profitable outlet in prospect. It is doubtful whether or not it is advisable for the average quarry operator to attempt to get rid of this material by making it into some useful byproduct such as a concrete brick, but it may often be possible to interest some other business man in a plant to make concrete products which can take care of the supply of fine material which the quarry operator produces.



At the right-hand corner of the main building is an underground hopper into which trucks from the adjacent quarry dump screenings. Ground storage is provided, also. Below is the truck which makes it easy to handle the conveying trucks from plant to curing tunnel or storage

In Buffalo concrete brick are being made successfully by the Rock Cement Brick Co., and this company utilizes the screenings from the Buffalo Crushed Stone Co. The plant of this brick company is located adjacent to the plant of the stone company, so that cement is the only material that needs to be transported.

A plant 30x40 ft., with a curing room consisting of two tunnels side by side each 106 ft. long and 13 ft. wide, with a little space around the plant for storage of stone screenings and the finished product is all that is necessary to produce 15,000 of these brick a day. The screenings from the quarry are dumped near the hopper just outside the building, the top of which is at ground level from this hopper, a 6-in. bucket elevator carries this stone to the storage bin of the continuous mixer. This mixer takes the stone, cement, and water and delivers the wet concrete mortar to a second elevator which carries it to the hoppers of the brick machines.

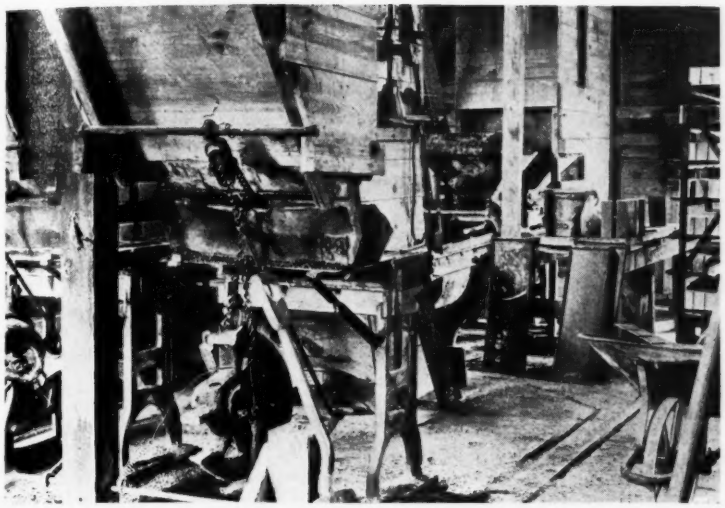
A batch mixer, in the opinion of J. E. Cochran, general manager of the company, would work better than the continuous mixer, and Mr. Cochran is planning to make the change soon.

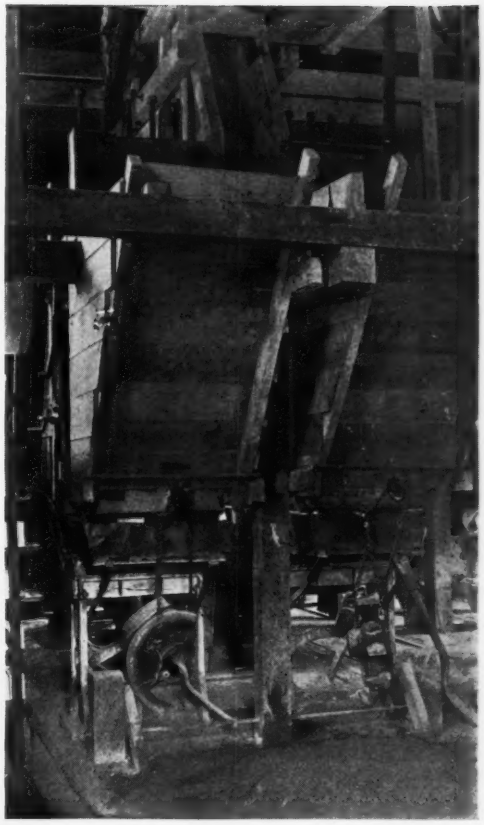
Two Peerless brick machines, each making 10 brick at a time, take the 1 to 4 mortar and tamp it into building brick of the ordinary size. The brick machines deliver the product to steel palettes of the right size to fit on a special conveying truck, and on these trucks the brick are put in storage for 28 days of curing or placed in the steam room for 18 hours of steam curing.

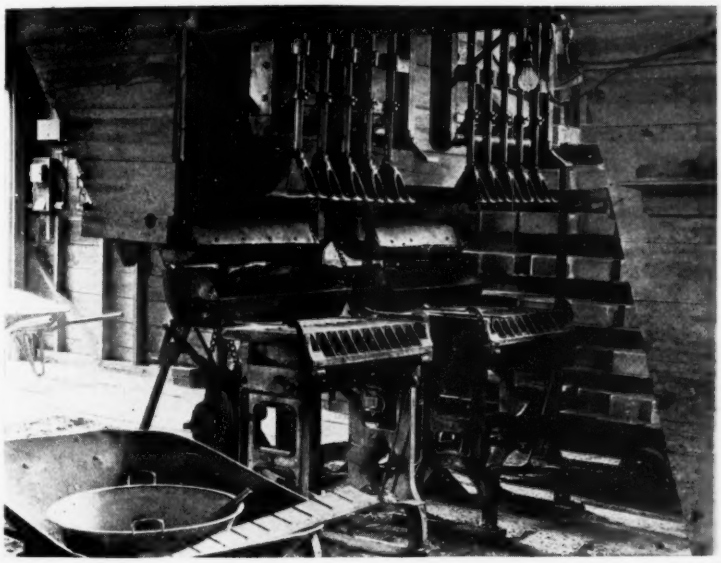
The illustrations show the brick machines and the interior layout of the plant. A 5 hp. motor drives the mixing machines, a 3 hp. motor is used for each of the two elevators, and another 3 hp. motor operates the two brick machines. A 20 hp. boiler furnishes steam for the curing room. Two lines of 1¼-in. pipe are laid along the floor for the full length of each curing tunnel, and ⅛-in. holes every 6 in. along the pipe permit steam to be injected into the curing room. During the summer two lines of pipe are placed overhead and a water spray is used to maintain the proper humidity.

Common brick are made by simply tamping the mortar into the machines. For making face brick a great variety of color effects can be obtained by using white marble, black slag, red and green slate, and many other kinds of crushed stone, separately or mixed in varying proportions, for the facing. The facing is mixed separately and about ¼-in. of it is placed in the bottom of each brick mold before the ordinary mortar is tamped in and this gives a brick of almost any desired color.

The special conveying trucks which have been referred to run on steel rails in the brick plant. On transverse rails in the







At the left is shown the cement mixer, with the stone dust elevator and part of a wet mortar hopper over one of the brick machines. Below at the left the two machines are shown and to the upper right the backs of the machines are shown.

Two curing tunnels 13 ft. wide by 106 ft. long make rapid curing possible when the demand keeps the plant running at capacity

The two steam pipes shown run the entire length of the curing tunnel, and steam is injected through 1/8-in. holes

passageway between the main plant and the curing plant is a truck with rails so arranged that the loading truck can be pushed from the main plant directly into the curing tunnel or carried outside the plant and pushed down to the end of the curing tunnel, where outside storage space has been provided.

This plant represents an investment of approximately $20,000, and when it is operating at its capacity of 15,000 bricks a day a crew of nine men, including two yard men, is necessary. Common brick can be produced to sell profitably at $14 a thousand at the plant, while face brick prices will run from $30 a thousand upyards, depending on the material used on the facing.

Mining Congress Opposes Coal Strike Peace Plan

PRESIDENT HARDING'S proposal for arbitration in the coal mining industry in effect acts to set aside the law of supply and demand which "must eventually regulate all industrial disputes," the American Mining Congress declared in a statement sent to the White House July 13 and made public through James F. Callbreath, secretary of the organization.

"Reopening of mines now on strike except upon a competitive basis, with nonunion in operation, would be ruinous," the statement said. "Moreover, such operation at high wage levels would create great dissatisfaction among the non-union mines, undoubtedly leading to strikes and thus cutting off the only reliable source of fuel. The proposal to open coal mines at the war scale of wages may seem temporary, but in effect it would be permanent."

Stating that the mining companies did not attempt to speak for the coal industry, but that they did represent the great Western mining industry, Mr. Callbreath said the congress considered that "the nation's welfare demands competitive wage scales as the result of actual bargaining, rather than a settlement induced by a suffering public helpless under the intimidation of and entirely for the benefit of men united under the banner of the United Mine Workers of America.

"It would be criminal," the statement continued, "if the non-union operators and miners who have enabled our industries to continue should now be sacrificed by a governmental order."

Seriousness of the coal situation in the Northwest was impressed upon President Harding and Secretary of Commerce Hoover by Governor Preus of Minnesota. That immediate steps are imperative to insure a coal supply for the Northwest was urged upon them.

Governor Preus was asked by Secretary Hoover to remain in Washington until July 17. Considerable significance was attached to this in view of the fact that definite replies as to the acceptance or rejection of the President's arbitration proposal are expected on that day. That the administration will take steps to insure resumption of work in the mines if the arbitration plan falls through was indicated.

A Visit from A. A. Alles, Jr.

"THE cement and lime plants in the 22 states I have visited during the past five weeks are working day and night," said

A. A. Alles, Jr., of the Schaffer Engineering and Equipment Co.

A. A. Alles, Jr., secretary and sales manager of the Schaffer Engineering and Equipment Co., of Pittsburgh, during a visit to Rock Products this week. "Conditions generally are very healthy, and personally I look for a continuous and active increase of business throughout the industry. Our own company is today experiencing the best business in its history." Mr. Alles succeeded Waller Crow in this company when Mr. Crow resigned to organize the engineering firm of Waller Crow, Inc. When the Fawcus Machine Co. became interested in the Schaffer company Mr. Alles, who is its secretary, was also made sales manager of the Schaffer company.

Mr. Alles, who is also an expert cost accountant, organized the Industrial Cost Association, with chapters in all the principal cities, and while he still retains his position as national director of the association, he resigned as its secretary-treasurer in January when going with the Schaffer company. He is also a member of the cost tariff committee of the American Gear Manufacturers' Association.

Seeks Quick Action on Rate-Fixing Law

SENATOR LA FOLLETTE of Wisconsin is preparing to move in the Senate that the interstate commerce committee be discharged of further consideration of the Capper bill to repeal the so-called rate guarantee section of the Esch-Cummins law. It was learned that the Wisconsin senator may take this step this week (July 10) at the conclusion of an address on the transportation act. The law, and particularly the so-called rate guarantee provision, has been the storm center of several political campaigns in the Middle West.

Organizations of farmers as well as laborers have strongly opposed the rate making provision of the law under which the Interstate Commerce Commission is called upon to fix rates so as to give the railroad owners a return of from 5½ to 6 per cent on their property. The movement for repeal of this provision has been sponsored by Senator Capper of Kansas, chairman of the farm bloc.

Lime Association to Meet Again in October

A SECOND convention of the National Lime Association—something never before attempted—will be held this year in October.

Matters taken up in the executive sessions at Cleveland in June were of such importance that this second meeting, which will be strictly a business meeting, was decided on to act on those matters after four months of deliberation.

A directors' meeting on August 3 will decide the place and exact dates for the two-day October meeting.

Improvements at Oakfield

THE old gypsum block plant of the U. S. Gypsum Co. at Oakfield, N. Y., is to be dismantled and a new block plant erected at the main plant. The old block plant is about a mile from the main operations.

The entire plant at Oakfield is running at capacity. Around 1600 tons of rock are being taken from the mine daily.

A new board plant is under construction, to have a capacity of 150,000 ft., which is approximately the capacity of the old one. In the gypsum plant the capacity has recently been increased from 1200 to 1400 tons daily.

What Makes a Good Molding Sand?

By Eugene W. Smith
Crane Co., Chicago

SAND for foundry use is a subject about which very little information can be obtained from books or technical papers. This probably is due to the fact that each foundryman requires a material best suited to the class of castings he is to produce. Different methods of molding—floor molding, bench molding, hand rammed and air pressed machine molding—require different grades, as also do heavy and light castings, castings which require a fine finish and those in which finish is unimportant.

Steel, malleable iron, cast iron and brass, melted at different temperatures in the order named, require different refractory conditions in the sand. Gases generated in different lines require varying conditions of porosity. Both conditions are governed by the silica content of the sands selected. As the silica content is increased the sand is weakened. In castings where there are deep pockets or close corners to be lifted, a greater bond is required. This bond is controlled by the varying alumina or iron oxides. The predominance of either may be noted by the color, iron giving the red and alumina the yellowish shades.

Summing up the foregoing, there are but two conditions required. Bond and porosity, alumina and silica, or in simpler words, clay and sand; for example, lake sand, almost entirely silica, and clay for brick and tile purposes, mainly alumina, neither being suitable for molding. Other oxides appear to have no particular value for molding purposes, lime in particular being detrimental to the finish of the casting in some lines. The finish is controlled by the texture or grain of the sand. The fineness is determined by running the sand through a series of sieves ranging from 10 mesh to 100 mesh.

There does not appear to be any set place or condition of mining. Good molding sands exist in almost every state, freight rates being the determining factor as to price in most foundries. It is sometimes taken from the hill tops, again from the prairies and sometimes in very deep banks in the hills with gravel pits below. From some of our Illinois farms it occurs in layers from 1 to 3 ft. deep. After the topsoil is removed, the No. 1 grade or finer sand comes from the top layer, usually 12 to 20 in. deep, the No. 2 grade below, being a little coarser, with the No. 3, still coarser next, followed by a clay soil.

In parts of Wisconsin different grades of sand (varying in texture) appear at the surface 100 to 500 ft. apart, and not in layers as above explained. It appears in some cases that certain grades of sand are the results of glacial deposits. It has always appeared to me that our fine sands in the West could be traced by drawing a line from the lower central part of Wisconsin southeast, curving through central Illinois, central Indiana and northern Kentucky to the Virginias. In the hills of Kentucky turning over the sod sometimes shows the finest of molding sands. Along the line mentioned can be found sands equivalent to the French prepared sands or the equal, if not the superior, of the Albany sands which are so well known throughout the country. The fame of the Albany sands dates from the time when our original foundries were located in the East. At that time, as now, water transportation was much in the public mind. Then, however, they did not have railroads at all; so the molding sands were sent down the Hudson and along the coast.

***REQUIREMENTS** for molding sands vary, and this article, prepared from the point of view of a foundryman and presented at the Chicago Foundrymen's Club, will help the molding sand producer to understand those requirements.*

It is noticeable that all Eastern sands are high in silica and very open and can be rammed very hard without harm to the casting, whereas the same treatment of our Western sands would result in loss. But their sands will not retain the bond as long as ours. Freight rates prevent a greatly desired interchange of sands between the East and the West, each having that which the other needs for blending purposes. Blended or milled sands are furnished by some dealers and samples shown are always attractive because of their uniform texture, but there is nothing to show that they are suitable for the class of castings to be produced, and in some cases the blending only serves to cover up features which would otherwise be objectionable.

No foundryman should confine himself to one grade of sand. At least two grades should be carried, one high in bond or alumina, the other high in silica for use in opening up sands when losses occur from blow, etc., and for facing purposes on heavier lines of work. The high alumina sands are to be added to the molding sand as a binder when it has been weakened by constant use or from other causes.

A good molding sand is often condemned on account of abusive practices by the foundryman. The excessive addition of new sand will invariably cause loss, both of castings and sand. Where sand is too strong or new it burns on the casting, causing waste. Excessive use of sea coal facing very often weakens the sand, the unburned portion in the molds after a short time destroying the bond by coating each grain with carbon. The sand becomes a deep black, whereas the natural color of burned sand is red. This condition can only be overcome by addition of a bonded sand.

Another weak condition comes from constant use of a sand for heavy castings, the bond being carried away with the casting and renewal being necessary. When an excess of core sand drops from the castings into the heap, increasing the silica, the sand is weakened and an increased bond is needed. As said before, silica is a weakener of sand, but is very necessary in the mold to create porosity to carry away the gases.

When castings are taken out of the sand and the sand is not sufficiently well knocked off the very best portion of the riddled sand is carried away and wasted. A common practice of pouring surplus metal into sand heaps causes a waste both of sand and of labor handling the metal. It is far better to furnish ingot molds for this purpose. Still another common practice of burning out, thawing or drying out new sand by pouring metal into it is extremely wasteful both of metal and sand.

Sometimes a sand is highly recommended by one foundryman to another as having given him wonderful results. Its appearance being favorable, a supply is ordered without considering that his own work is heavier, the result being that the sand is soon burned out and weakened, with a consequent loss of product. Thus it is very apparent that one standard will not suit all lines of work.

Herewith I give a few sands taken at random from different states, showing

variations in the elements and composite fineness of most of them. I intentionally omit names and brands of sands. A study of the table should show the variation met with in all molding sands. It would be a very desirable feature if all sands sold could be accompanied by a standard analysis. This should particularly apply to blended or milled sands where the texture has been changed and sometimes an otherwise unsuitable sand is made to appear satisfactory.

A FEW AMERICAN MOLDING SANDS

	Opener	Binders		Of No Particular Molding Value					Texture and Finish
	SiO_2, %	Fe_2O_3, %	Al_2O_3, %	CaO, %	MgO, %	Alkalies, %	SO_2, %	Fineness	
Tennessee	92.96	3.10	4.92	.....	.....	0.26	.....	98.58	Fine Weak Open Coarse
Long Island, N. Y.	89.16	2.92	4.66	.....	0.33	0.33	.....	0.53	Weak Open Coarse
New York	82.34	4.24	8.50	0.96	0.40	1.79	0.54	1.70	Strong Open Coarse
Indiana	82.50	2.70	8.90	0.16	0.61	1.47	.....	0.59	Strong Open Medium
Wisconsin	82.87	2.67	8.45	0.80	0.89	1.00	Trace	57.3	Strong Open Medium
Indiana	79.66	9.74	3.36	1.34	0.68	2.50	.....	78.34	Strong Open Strong
South Carolina	79.30	4.10	10.70	1.19	1.29	.....	.....	.....	Open Open
Kentucky	76.16	4.24	12.02	.....	0.72	1.21	.....	.....	Fine Strong Strong
Ohio	77.14	6.44	9.20	Trace	0.91	1.10	.....	.....	Open Coarse
Illinois	75.70	13.46	3.00	0.60	1.08	2.15	0.19	0.60	Strong Close
Illinois	56.80	5.09	14.43	6.40	5.60	3.15	0.14	70.24	Fine Strong Very close

The present practice of selling and purchasing molding sands appears very crude. Small spoonful samples are shown by the salesman and are supposed to represent the contents of carloads to be shipped. The purchaser squeezes it into a ball to test the bond and finish by "feel," and sometimes puts it to his ear and rubs it to test its openness by "sound." All that is left for him to do is to taste it. If the Bureau of Standards, universities and technical men can devise some form of table, such as is presented here in an incomplete shape, it would prove a great help both to the producer and consumer.

Molding Sand Research

A JOINT research committee of the American Foundrymen's Association and the National Research Council has undertaken research work of broad scope on molding sands. R. A. Bull, research director of the Electric Steel Founders' Research Group, of Chicago, is chairman of the joint committee, and *Iron Age*, recently reported the early work of the committee.

The first step in the investigation, the preparation of a bibliography, has been completed. This was done by the secretary of the committee, R. E. Kennedy, who is also assistant secretary the American Foundrymen's Association. He not only listed all articles which have been written on the subject of sand and sand tests, but has abstracted all information which might be of use to the committee.

The importance of the work undertaken by the committee is indicated by the fact that $7,500,000 was spent in 1920 for molding sand alone. Mr. Bull stated that the problem confronting the investigators was particularly difficult because no standards have been established by which to gage the quality and suitability of various sands for different purposes and no satisfactory tests have been devised for ascertaining such standards. The next step in the work, he said, would be on the subject of tests. The committee has found, for instance, that even tests for fineness are not uniform. Sieves may have the same number of meshes per square inch, but owing to the fact that there is a difference in the diameter of the wires, the results from different tests are not conclusive. The personal aquation in sifting also prevents accuracy in fineness testing.

It is difficult also to determine the percentage of moisture in sand, and even when it is determined it does not always have the same significance. It has been found, for instance, that it is better to store high bond sand in a moist atmosphere than to permit it to dry out and then to restore the moisture subsequently. The reason for this is not yet clear.

A satisfactory test for bond is also lacking. One method is to push a bar of sand over the edge of a table and measure the length of the portion which drops off. Others take the weight of the portion which drops, but in either case much depends upon the surface of the table top, the speed at which the bar is moved and the friction between the bar and the table.

These are just a few of the problems confronting the committee. Mr. Bull stated that one important result of the investigation would be to make available to the foundry industry many sand deposits which have not yet been exploited.

Affairs of the Illinois Concrete Aggregate Association

GENERAL regret will be had in the announcement that J. D. Pierce, secretary of the Illinois Concrete Aggregate Association, will no longer be associated with that organization after August 1. In an interview with a ROCK PRODUCTS representative Mr. Pierce stated:

"Taking advantage of an unfortunate condition in Chicago, two or three Central Illinois producers influenced a group of their competitors to resign from the association. This impaired the finances to such an extent that activities and expenses had to be stopped. The association, however, has not decided to disband.

"The motives for this secession have been of a political and selfish nature and contrary to the principles of organization effort. In the recent attempt of the National Association of Sand and Gravel Producers to reorganize, the leader of the Illinois secessionists was unfortunately given a part, and has again inoculated the proceedings with discord.

"So in Illinois, instead of 'trust busters,' we have the new profession of 'association busters.'"

Mr. Pierce will spend the month of August up in the North Woods, taking a much-needed rest. Former Treasurer J. C. Brandt has resigned and the new treasurer is S. A. Gibson of the Rockford Sand and Gravel Co., Rockford, Ill.

More Cement Sold Than Ever Before

DURING the Atlantic City meeting of the representatives of 85 cement manufacturers it was made plain that not only is cement in demand, but every material that is used in construction work.

"From January 1 until May 31, according to the United States Geological Survey," said William M. Kinney, of Chicago, secretary and general manager of the Portland Cement Association, "there have been sold 5,000,000 more barrels of cement than in the same period in 1921 and 4,000,000 more than in the same period in 1920, the banner year of the business."

When Is It Justifiable to Expand?*

A principle to consider before tying up resources in plant and equipment

By H. P. Losely
Engineer, James E. Morrison Co.

As soon as manufacturing activity becomes more intense, managers will again begin to experience the urge to purchase more equipment and to make extensions to their plants. Requests may be made by men in the organization who see opportunities for "savings" and "increased profits," or salesmen may come in and present apparently convincing grounds for using their particular proposal. The main policy of increasing manufacturing facilities may also require consideration. The principles to follow in making recommendations on such contemplated action are worthy of consideration.

The first concept to develop is the value of capital and the return we should expect from its use. The correct estimation of this figure is of prime importance, as the continual use of too low a figure will almost certainly bring the business into an over-extended position. An article in the *Annalist* of May 2, 1921, under the initials W. S. S. presents an excellent key to the analysis of balance sheets of manufacturing corporations, and gives 15 cents on the dollar as the ratio of profit to capitalization, although no detailed reason for this figure is given. The writer has arrived at this same 15 per cent by the following reasoning:

Utilization of Financial Resources

We may accept as axiomatic that one of the management ideals is to utilize financial resources to the best possible advantage, and we may further assume that the finances are being so managed that not only are current assets greater than current liabilities, but also a substantial reserve fund is maintained in liquid investments. We have, therefore, fundamentally two factors to consider in making an investment in additional equipment: the rate of return on the "excess capital" and the rate of return on the proposed equipment.

Assuming the investments of excess capital to be in charge of an experienced and level-headed business man who uses all available information, then a return of 100 per cent profit in a period of five years is not extraordinary. This is equivalent to an interest rate of 15 per cent per annum compounded annually. This figure of 100 per cent may not always be attained, and sometimes it may be exceeded.

The experienced investor who buys near the bottom and holds through minor fluctuations to near the top, then sells out and places funds in the bank at 3 per cent will gain approximately this amount in the long run. If short selling during the period of declining prices is resorted to, the gain will be even greater.

Needless to say, this return of 15 per cent on "excess capital" cannot be earned by buying securities whenever the company happens to have idle funds and selling them when cash is required; it requires vigilance, the courage and vision to purchase during times of depression, and the wisdom to sell during excessive inflation. That fluctuations of such magnitude occur to make this high return possible, may not be a particularly brilliant testimonial to management in general and the moral aspect of taking advantage either of bargain counter prices or of inflated markets has been questioned.

However, the fact remains that as managers learn more and more to prepare to take advantage of these situations, these preparations will automatically help to reduce the amount of fluctuations actually occurring and are therefore a beneficial influence. The educational process is, however, so slow (as illustrated by the fact that a large number of manufacturers are still operating without adequate cost systems in spite of wide educational efforts) that, for several years to come, the economic organization of affairs will still make the annual average earning of 15 per cent on outside investments. We may, therefore, very well make the broad statement that: *Any new equipment which cannot be made to yield an average annual return of 15 per cent after charging off the proper depreciation is a bad investment, since it ties up resources without any compensation.*

Of course, if the installation is of such magnitude that a funded debt can be created to obtain part of the necessary capital, then only the unfunded portion should be made to show the 15 per cent or more yield after depreciation, interest on the funded debt, etc., are paid.

Factors in the Cost Estimate

The figure used in the cost estimate should allow a margin for unexpected items and should, of course, include provision for any special work (designing, special trips, etc.), as well as any freight charges and erecting costs. If much of the work is special and no contractors' bids are available, the proposed cost figures should be carefully scrutinized. In case the proposed installation is of appreciable size it will also be necessary to examine working capital requirements. If large additions to stores or material in process are required, then the financing of this additional burden should receive consideration.

In considering depreciation, which is here understood to include obsolescence, a sharp distinction is to be drawn between special and standard equipment. Usually the former will be worth only scrap value when it is discarded and this scrap value may be relatively high if many standard parts enter into its makeup. The estimate of the life of special equipment is an important feature and where changes in product or in demand for goods are of influence it is well to place the life estimate low. On the other hand, depreciation rates on standard equipment are fairly well established, the obsolescence allowance is low and in case of manufacturing charges render the equipment superfluous, it can be sold at the loss of depreciation plus setting up and tearing down expenses.

The same theory applies to buildings. If a standard type of building is erected in a suitable neighborhood, the proper allowances are readily determined, whereas a special building or one erected in an out-of-the-way location may be worth little more than a wrecker's price if no use can be made of it. If the proposed item is large, then the probable effect of market fluctuations on its value also should be considered.

*Abstract of article in "Management Engineering," Vol. I, No. 3.

Return on Equipment

The concept of the return on the equipment may now be discussed. While decreased labor cost on the individual operation may be the most obvious item, there may be other factors which entirely outweigh this. The most important principle to observe is that the effect of the proposed installation on the whole production must be considered. A certain breadth of view must be maintained. Whenever a certain activity serves as a support for other activities, a separate valuation of each is dangerous if not entirely out of place.

The value of balancing equipment is generally well enough known, but it does not usually receive the analytic attention to which it is entitled.

Determining Need for New Plant

An example may serve as a warning to concerns contemplating building new plants to replace old ones. In this case, one company was operating three mills in three different locations of one city. Plants B and C were more modern and, having been designed according to the latest experience, were operating somewhat more efficiently than the older plant A. This latter was apparently in a poor location and the general opinion of the executives was that sooner or later operation would have to be discontinued and a new mill (proposed plant D) built next to plant C, which had a good location with railroad connection. The engineer sat down to make a report on the situation with somewhat of a "hunch" that a new mill should be built and rather predisposed to recommend that plans be commenced at once. While certain water-power rights were being utilized to advantage, the chief factor militating against the old mill was its location on a hill, causing hauling costs on raw material and finished product. Also the layout of the mill was the cause of a small amount of excess inside labor. A concise tabulation of all the factors was prepared and the obvious conclusion was as much a surprise to the engineer as to the executives. The five factors considered were:

1. Power
2. Building and land investment
3. Transportation
4. Building efficiency
5. Supervision and labor situation

1. *Power.*

Plant A		
(a) Steam: 7,200 tons coal at $6		$43,200
Interest and depreciation at 12½ per cent on $20,000—machinery	2,500	
Firemen, etc.	11,000	
		$56,700
(b) Water: Interest on hydraulic valuation	$2,500	
Reserve for maintenance	800	3,300
Total Power A		$60,000
Plant D		
(a) Steam on same basis		$56,700
(b) Electric power additional		8,500
Total Power D		$65,200

2. *Building and Land Investment.* The land factor is ignored as the company owned land in both of the considered locations and there was only a small difference in the market value. The old building was carried at $80,000. Due to increased cost of construction it was conservatively estimated that at least $120,000 would have to be spent to put up a new building of equal capacity. The old building was already partially depreciated on the books; so an obsolescence charge of 7½ per cent was considered conservative, whereas on a new building it would be necessary to put this rate at not less than 8½ per cent. The interest rate of 8 per cent was obtained by computing a mortgage at 6 per cent and the balance at 15 per cent. The figures therefore stood:

Plant A	Per cent
Interest	8
Depreciation and obsolescence	7½
Maintenance and insurance	1½
Total 17 per cent on $80,000 = $13,600.	

Plant D	Per cent
Interest	8
Depreciation and obsolescence	8½
Maintenance	1½
Total 18 per cent on $180,000 = $21,600.	

3. *Transportation.* After a preliminary casting up of figures, it became apparent that the situation was not at all decided against the old site. A little research work revealed the fact that the hauling was being done by an outside teamster on a day basis and full value was not being given. The grade on a short section of the road was steep and had instilled all concerned with the idea that motor trucks could not be used the year round. Some demonstration runs were arranged and after a few days' test it was apparent that the cost of hauling could be cut from $1 per ton by team to 50 cents by truck. The carting away of ashes was usually contracted for fill-in purposes. The situation then stood:

Plant A	
40 tons per day at 50 cents for 300 days	$6,000
Ashes daily $2.50 a day for 300 days	750
Total Plant A	$6,750
Plant D	
Raw and finished material loaded direct from siding	
Ashes daily $2 a day for 300 days	$600
Total Plant D	$600

4. *Building Efficiency.* An investigation of the excessive handling in the old plant showed that the total number of men affected was only 26 and an analysis of their activities showed that the most that could be eliminated would be 3. It seemed reasonable, therefore, to charge the old mill with the labor cost of these three men, approximately $15 per day or a total of $4500 per year. It was later shown that changes in the old building could be made to reduce this, but this factor is at present ignored.

5. *Supervision and Labor Situation.* How much advantage is to be obtained from centralized production will always depend on the management as well as on the size of the mills, number of men employed, location of men's homes, officials' traveling time and other factors. In many cases it is more a matter of sentiment than of dollars and cents. In this case there were many employes who had been with the company several years and had homes convenient to the plant. A change would have seriously inconvenienced them; would have cost time and money and disorganized production. This would have cost far more than the slight advantage to the few officials who had business in all three plants and so had to go from one to another.

Summary Estimates

The summary of the estimates for the two plants indicated the following operation costs affected by the proposed change:

Item.	Present Plant A.	Proposed Plant D.
1. Power cost	$60,000	$65,200
2. Building charges	13,600	21,600
3. Transportation	6,750	600
4. Inefficiency of building A	4,500	.....
	$85,850	$87,400

It is quite evident from the foregoing that a new plant would have been at a disadvantage. In this particular case there was no further question of putting up a new building and the policy of the company, which had been wavering, and therefore unfavorable to any progressive developments, was settled for at least a few years and both officials and employes knew where they stood.

This example is explained at such length because it can be used to point out an important consideration in respect to Item 2. It might have been that the disadvantage of the old building was somewhat more serious than shown—say, to the extent of a further annual charge of $3,000—so that the comparison would indicate the advisability of a new building. Such is not the case, however, unless the old building can be disposed of for $80,000.

It must be kept in mind that as any art progresses and newer machinery and methods become available, the older plants are to be written off until they reach the rating at which they can be sold as scrap or are to be adapted to other purposes. Thus, if the proposed new plant indicated for the old plant a transportation disadvantage of $8150 and a building inefficiency of $8450 annually, we would make the building charges $10,200, so as to balance A and D as follows:

Item.	Plant A.	Plant D.
1. Power cost	$60,000	$65,200
2. Building charges	10,200	21,600
3. Transportation	8,750	600
4. Building efficiency	8,450	.....
	$87,400	$87,400

In other words, instead of capitalizing the building at $80,000 we would capitalize the building at only $60,000, giving at 17 per cent an annual charge of $10,200. The $20,000 difference would be written off as obsolescence.

One of New Mexico's Few Sand and Gravel Plants

This plant is owned and operated by the Las Vegas Sand and Gravel Co., Las Vegas, New Mexico. It has a capacity of 150 yards a day and is well equipped with elevating, washing and screening machinery

As is well known, there are but few sand and gravel washing plants in the state of New Mexico. In Las Vegas, however, there is located the plant of the Las Vegas Sand and Gravel Co., which is operated under up-to-date conditions and has a good equipment of the necessary machinery. This plant produces on the average about 150 yd. per day of washed and graded material. Its general arrangement is shown in one of the accompanying illustrations.

Here the material passes through the lowest screen and is flumed to the conical sand separator which removes the dirty water and discharges the clean sand into the bin below

The material is excavated by a 1-yd. orange-peel bucket operated by a movable derrick having a 50-ft. boom. The material is then placed in a portable hopper from which it is spouted to 1-yd. dump cars. These cars are pulled up the incline (shown in an accompanying illustration) by a 5x7-in. hoist. The operating controls of the hoist are located at the top of the incline so that the incline is in full view of the operator.

The dump cars discharge into a hopper under the trestle and the material then passes over a bar grizzly. The large stones go directly to a No. 4 gyratory crusher. The gravel passing through the grizzly is carried to the top of the washing plant by a bucket elevator using 14x8 x12½ in. overlapping continuous buckets, mounted on a single strand of No. 844 Ley detachable steel bushed chain.

From the elevator the material passes to a set of three Dull inclined conical gravel washing screens. The first screen accurately removes the oversize stones and returns them to the crusher. The other material passes into the remaining screens, producing two grades of washed and sized gravel. Rinsing sprays are employed to clean off the dirty water and fine sand from the gravel before it leaves the screens.

All sand and dirty water pass through the lowest screen and are then flumed to a conical sand separator, which automatically removes the dirty water and discharges the clean sand into the bin below.

The elevating, washing and screening equipment for this plant was furnished by the Link-Belt Co.

General arrangement of the plant of the Las Vegas Sand and Gravel Co.

Experiment Station Makes Bricks From Dolomite

At the ceramic experiment station, Columbus, Ohio, the Bureau of Mines has made standard sized bricks from calcined dolomite and from raw dolomite, using 10 per cent of the flux Fe_2O_3, Al_2O_3, SiO_2. Calcined dolomite was found undesirable for brick making as the mud slakes so rapidly, and on account of enormous shrinkage during drying and burning, all samples cracked badly.

The raw dolomite, together with 10 per cent flux, gives excellent promise. The bricks so burned to 1450 deg. C. were sound, of high density and have not yet shown signs of slaking when subjected to the boiling test.

How One Sand and Gravel Company Markets Its Material

The Machias Sand and Gravel Company, Olean, N. Y., with modern and efficient equipment, sell from 2000 to 3000 tons daily. Supervising Engineer Knoblauch says that the company have three distinct departments—they produce efficiently, sell the same way, and collect when they can. The policy is a combination of business and pleasure. Here is his story in his own words:

AS readers of your very interesting publication in connection with the nonmetallic mining industries, we find ROCK PRODUCTS a remarkable organ for the advancement of so extensive a line of business, but— Would it not be perhaps a little more interesting at times if you acquainted your readers with something more than just the various processes used throughout the country in producing nonmetallic minerals by telling them also about the various methods—and we have no doubt but there are many—used in disposing of this material, and at a profit?

The Machias Sand and Gravel Co., Inc., here in Olean, N. Y., with its modern and efficient equipment produces the enormous capacity of from 2000 to 3000 tons per day —and *sells it*. May we not be permitted at this time to explain why it is we combine our business with pleasure?

Three Distinct Departments

There are three distinct departments in our business, namely, Production, Distribution, and Accountancy. This is a very simple plan. The first department produces efficiently; the second sells just as efficiently, and the third collects when it can.

In our organization there has been injected a little "Hooverism." We believe, one and all, from the fellow who cleans the cars to the chap who has the lowly title of president, that the only way to "promote the washed sand and gravel business is by promoting the washed sand and gravel business." And also that the only way to sell the people clean aggregates is to get them to buy clean aggregates. That explains, perhaps, why roadside pits and creek operations affect us not at all.

Our business is run on policies—not drastic, deep-seated complex policies—merely policies.

We produce good material, and we know it. We also see to it that the other fellow knows it. That explains one of our folders.

What the Service Means

ROCK PRODUCTS here reproduces the two inside pages. The first of these pages says:

Our efficient service means PROFIT to YOU. Order one car or a trainload

THE MACHIAS SAND & GRAVEL CO., Inc., maintain a steady average production of 2000 tons daily.

THE NEWLY COMPLETED CANAL supplies a steady flow of clean water for washing at the rate of 3000 gal. per minute.

THE NEW DIVERSION RESERVOIR will hold a four weeks' supply in the dryest of seasons.

A NEW CONVEYOR 300 ft. long reaches out into the center of an 80-ft. bank—an unlimited supply from a highest grade deposit.

A NEWLY EQUIPPED CRUSHING UNIT breaks the flinty deposit of oversize—producing a clean, hard aggregate with 40 per cent broken surfaces—the highest quality of road material to be found.

Double Units throughout insure steady and reliable SERVICE

The high grade deposit and modern equipment insure the QUALITY

The large oversize machinery and capable organization insure VOLUME

Service—
Quality—
Volume

The second page reads as follows:

CAPACITY—40 Cars Per Day

SAND—for plastering, masonry and all classes of concrete.

GRAVEL—for roofing, highways, pavements and foundations.

GRADED AND WASHED CLEAN
(Passing New York and Pennsylvania State Highway Specifications)

Plant on Penna. R. R. at Machias, N. Y., near jct. B. R. & P. Ry.

THROUGH RATES ON ALL RAILROADS

We believe in "concrete for permanence," and we bend our efforts to see that the other fellow believes in it. That explains our other folder.

This folder carries the title "When Is Concrete Permanent?" and includes two pages shown on this page.

We put good sand and gravel on cars and ship it to the various contractors; these contractors put it on trucks and through their mixers. A few months later the automobiles fly across smooth and attractive pavements and the sand, the gravel and the contractors are forgotten. Not so in our business.

We have good reason to be proud of that smooth and inviting pavement and we do not hesitate to tell the people so by attractive signs. Motorists in Western New York and Pennsylvania are relieved of the monotony of the pretty hills and streams by signs which occasionally show that this highway was built in a certain year by a

TO BE PERMANENT—Modern methods and machinery must scrub, clean, crush and grade the aggregates.

CLEAN AGGREGATES — mean strong concrete. Only by modern methods and costly up-to-date equipment can Nature's product be prepared for concrete structures, EVERLASTING, PERMANENT AND ATTRACTIVE.

THE UNSIGHTLY, PEALING, PITTED PAVEMENTS, WALLS AND STRUCTURES—tell the story of unwashed aggregates.

THE STRENGTH OF CONCRETE IS IN THE QUALITY OF THE AGGREGATE

IT MUST BE CLEANED— AND IT MUST BE SCREENED

INSIST ON WASHED AND GRADED SAND AND GRAVEL FOR YOUR CONCRETE

THE MACHIAS QUALITY SAND AND GRAVEL—is produced from the largest glacial deposit in Western New York.

THE DEPOSIT MANY ACRES IN EXTENT AND—over 100 ft. in height, contains the hardest and most abrasive resisting material ever tested.

IN ITS ORIGINAL STATE THE MATERIAL—ranging from fine sand to large boulders is handled by the most modern up-to-date equipment used in producing road materials.

WE USE NEARLY ONE MILLION GALLONS OF WATER PER DAY TO WASH CLEAN OUR MACHIAS QUALITY AGGREGATE

SAND FOR PLASTERING, MASONRY AND ALL CLASSES OF CONCRETE. GRAVEL FOR ROOFING, HIGHWAYS, PAVEMENTS, AND FOUNDATIONS.

certain hard-working contractor, and, last but not least, that it was built of "Machias Quality Aggregates."

If the same motorists live near post offices or read the local papers frequently they will know why the road was built of "Machias Quality Aggregates." Why? Because the name "Machias" does not only appear on signs and folders, but in all the newspapers, whether it be the *Buffalo Courier* or the *Bingville Bugle*.

The plant of the company is off the main road about a mile, but that does not deprive it of its share of visitors. When you near a roadhouse you are sure to find the "home of good eats" sign along the highway; so, also, when you near our plant you will find an attractive sign—an invitation to visit the home of Machias Quality Aggregates.

I have mentioned before that we have certain policies; along with them we have certain beliefs. Here is our creed:

The Machias Creed

We believe, for instance, that wherever a bag of cement is bought there is a place to sell a little aggregate with it—and we sell it.

When John Hemlock, up at the head of Lost Creek, builds a milk house, we show him why he should use clean aggregate—and then he usually uses it.

We believe, when we see a concrete culvert, bridge or sidewalk built of bank-run aggregates, and falling to pieces—that this is a waste of good money, and the people's money at that. Then through the medium of the local papers and the courtesy of Uncle Sam's mail, there are not very many people in a 200-mile radius of Machias who have not had placed before them an example of this waste of money.

We believe that it is better to spend the profit on a car of material tracing that car by long-distance telephone than it is to disappoint a contractor.

We believe that there is someone going to get stung waiting for freight rates to come down, and therefore we do not hesitate to call his attention to the possibilities of this undesirable sting. Our little red sticker so notifies this "someone."

We believe that blotters are an attractive and useful help. And while we know that perhaps 90 per cent of these blotters are thrown in the wastebasket, to overcome the loss we send another to replace the lost blotter. Our friends the contractors say that the little feature of having a three-months' calendar printed on that same blotter makes it mighty convenient in knowing the date when their last note matures.

We believe that railroads are made up of really big men, and human men at that. We particularly remember this when we have any transactions with them, and for this reason delays because of lack of cars rarely appear upon our delay sheets.

We believe, when we are entitled to a certain commodity rate, that the railroad wants us to have that rate, and we sell it to them just as efficiently as we sold that last road job. And, Producers, please give heed to this: One lesson we have learned is this: You rarely gain a point by the certain senseless remarks against the railroad executives which frequently appear in some of the industrial papers.

We believe that the organized effort of the sand and gravel industries should be directed toward consistent promotion in connection with concrete construction. If these efforts are so directed we believe that priority orders and shipping restrictions will most surely take care of themselves.

It is just possible that some of the readers of Rock Products will find in these lines a few helpful hints and suggestions.

In conclusion let me say that our company is mighty curious to know this:

How many of the large number of efficient plants described in recent issues of Rock Products dispose of the enormous capacities they have rated?

(Mr. Knoblauch has given us a most interesting talk on how his company makes known its products; its methods of "follow-up" in making sure that its products are fulfilling their purpose; how it co-operates with the contractor after that product has been shipped; its campaign to inform the taxpayer what he should expect from the expenditure of his money; how the motorist and passerby knows that "Machias" is always behind its product until it is laid down and put to its purpose of serving the "consumer."

The editors are glad to publish Mr. Knoblauch's "talk," and we have his assurance that he will be delighted to have his company's plans and methods freely discussed through the columns of Rock Products. These methods should incite a discussion that will surely be provocative of much that will be interesting to the industry, and of exceeding merit.—The Editors.)

WARNING!

Do not wait for a reduction in freight rates to become effective—remember that the settlement of the coal strike means car priorities and shipping restrictions — avoid the rush that's sure to come by starting shipments now!!!

That "little red sticker"

Heaviest Contracts Since 1920

Nearly $35,000,000 greater than corresponding period of 1921

WITH June's contracts awarded figures added to those of the preceding five months a gratifying picture of construction activity is afforded for the first half of 1922, says *Engineering News-Record*. Contracts to the value of $779,766,747 were placed, an average of $130,000,000 per month. The June total is $175,445,000 for the United States, with an additional $6,897,000 for Canada. This record was exceeded only in March, 1922, when contracts to the total amount of $191,782,262 were let. Compare this record with other half-years:

1913	$329,326,302
1920	968,685,857
1921	581,249,777

This is a straight money comparison, which ignores the changing value of the construction dollar. Reducing these figures to actual volume gives:

1913	100 per cent
1920	116 per cent
1921	78 per cent
1922	137 per cent

The figures in the accompanying table are compiled from *Construction News*, where minimum projects reach $25,000 each on public works, $40,000 on industrial construction and $150,000 in the case of commercial buildings.

Building construction throughout the United States during June aggregated $1,972,000 less than in May, 1922, but increased $27,155,000 over June, 1921, and exceeded the totals for June, 1920, by $52,459,958.

VALUE OF CONTRACTS LET IN THE UNITED STATES AND CANADA IN JUNE, 1922

	New England	Middle Atlantic	Southern	Middle West	West of Mississippi	Western	Canada	Total
Waterworks	$ 849,000	$ 643,000	$ 430,000	$ 1,120,000	$ 1,082,000	$ 295,000	$ 705,000	$ 5,124,000
Sewers	....	1,009,000	286,000	2,540,000	594,000	336,000	393,000	5,158,000
Bridges	121,000	4,148,000	710,000	1,408,000	965,000	920,000	353,000	8,625,000
Excav. and dredging	....	....	....	427,000	366,000	1,812,000	23,000	2,628,000
Streets and roads	1,969,000	7,092,000	7,608,000	11,740,000	7,121,000	4,723,000	1,885,000	42,138,000
Industrial works	3,360,000	6,317,000	894,000	11,212,000	1,545,000	359,000	873,000	24,560,000
Buildings	3,337,000	25,642,000	6,258,000	36,739,000	8,523,000	3,232,000	2,361,000	86,092,000
Fed. government work	59,000	720,000	271,000	65,000	40,000	935,000	....	2,090,000
Miscellaneous	1,062,000	1,558,000	666,000	1,172,000	272,000	893,000	304,000	5,927,000
Total	$10,757,000	$47,129,000	$17,123,000	$66,423,000	$20,508,000	$13,505,000	$6,897,000	$182,342,000

Manor Properties Proving Economical and Efficient

THE new operation at the Manor properties of the Charles Warner Co., located on the Delaware river just north of Tullytown, Pa., has been in operation for three or four weeks and has already proved itself to be economical and very efficient.

This Manor property consists of about 600 acres of proven sand and gravel bearing land. The sand and gravel strata are about 20 ft. thick and lie from 2 to 4 ft. underneath the surface. Immediately underneath the gravel is a hard pan of clay. The method of getting out this material is as follows:

A large Dravo dragline excavator with a 2½-ton bucket loads the sand into large standard-gage hopper cars holding from 60 to 70 tons of material, and it takes about 15 minutes to load. After the material is loaded a steam locomotive takes away the loaded car and switches in place an empty. The full car is then taken down to the water's edge, out on a trestle and dumped into a sort of hopper or crib. This crib is rectangular in shape, the shore line forming one side and the other three sides of piling.

On the side of the crib opposite the shore is an opening where the floating dredge Jackson is located, its elevator buckets extending through the opening down into the crib. The material in the cars is dumped into this and the dredge buckets bring it up. This dredge is a complete plant in itself for washing and screening the material into such marketable products as concrete sand, pebbles and boulders.

U. S. Investigating Fluorspar

R. B. LADOO, mineral technologist of the U. S. Bureau of Mines, recently spent a month in the southern Illinois and western Kentucky fluorspar field in order to complete the investigation of the fluorspar industry. The outstanding feature of the fluorspar situation is that our known reserves are very low, and, unless new deposits are found, fluorspar will be very scarce and expensive within a few years.

The development of possible substitutes is being considered. The object of the fluorspar investigation is the eventual preparation of a bulletin on all phases of the fluorspar situation.

Indiana's Supply of Road Material

INDIANA is well supplied for road-building materials for its secondary system of state roads, according to a recent survey by the state department of conservation. Virtually all the sand, gravel and crushed stone is produced within the state. Last year the production of road and commercial sand and gravel exceeded 2,500,000 tons and will exceed this tonnage this year.

In the 1922-23 road program of the highway commission, the state will call for thousands of tons of gravel and crushed stone. The first of the secondary road systems will be started within a few weeks and 84 miles will be built this fall.

Recent I. C. C. Decisions

A HOLDING of unreasonableness and an award of reparation have been recommended by Examiner Quevedo in No. 12480, Davison & Namack Foundry Co. vs. P. R. R., Director-General et al., as to rates on gravel and sand, from Millville and Clayville, N. J., to Ballston Spa, N. Y. They exceeded the aggregate of intermediates from and after June 7, 1917. At the time of the movement the aggregate of rates to and from Schenectady were as follows: $2.80 until June 25, 1918; $3.20 until August 26, 1920; and $4.74 thereafter. Quevedo said the fact that the through rate was blanketed to a number of points was not enough to rebut the presumption that joint rates exceeding the aggregate of the intermediates were unreasonable.

Examiner John A. McQuillan, in a report on No. 13329, Alpha Portland Cement Co. vs. P. R. R., and parts of fourth section application No. 1625, has recommended a finding that rates on cement from Martins Creek, Pa., to points on the Pennsylvania between Riegelsville and Stelton, N. J., are not unreasonable or unduly prejudicial. The examiner said the Commission should deny fourth section relief because the rates in effect to Stelton and other points on the route thereto violate the equidistant part of the fourth section and the Commission has no authority to grant relief as to such rates.

In a report on No. 10717, Portland Traffic & Transportation Association et al. vs. Director-General, Southern Pacific et al., opinion No. 7688, the Commission found the interstate rates on cement from Oswego, Ore., to destinations in Oregon, Washington, Idaho and California not unreasonable, but unduly prejudicial, against Oswego and unduly preferential in favor of competitors at Bellingham and Concrete, Wash., and certain points in California. No order was issued requiring the carrier to establish rates, but the Commission said it expected them to adjust their rates in accordance with its findings.

"Don't Be a Clam"

USUALLY, the moral of a story is tacked on at its end, but this particular moral is so pertinent that we have used it as a headline to clinch our point.

The Ohio Hydrate and Supply Co., of Woodville, Ohio, recently employed the C. C. Stockford Co., of Toledo, to tell the world that its booklet—a very handsome thing typographically, by the way—"A Job That Took a Million Years; or, The Tale of a Clam," is selling immense quantities of lime. The story is written to give helpful expression to facts gained in the 16 years' experience of the Ohio Hydrate and Supply Co., as manufacturers and distributors of lime, and that "we may avoid the fate of the clam as unfolded on the following pages."

This book tells how Nature has for centuries been working out the processes of her laboratory; that lime is more than "plaster." The next step briefly outlines the journey the clam takes from its resting-place in the rock to its final destination in the modern structure. Then follows the manner the lime is marketed, the containers, loading sheds, handling, etc. The booklet ends with a description of the various types of construction work in which the company's products have been used, what it all means—and why.

Then, of course, there comes that moral to the dealer: "Remember, a clam eventually becomes a fossil—don't be a clam."

An Outline of the Uses of Lime

UNDER the above title, the National Lime Association, Washington, D. C., has issued brief No. 251. This brief outlines the uses of lime under three main heads, agricultural, constructural and chemical; from the point of view of the functional capacity of the lime, grouping those uses which depend fundamentally upon the same action of the lime. The plan of the brief is to point out primarily the functional capacities and illustrate each of them by those specific uses and industries of which we have published records. The chart represents a very condensed form of the subject, and is intended to give a bird's-eye view of the whole field. The text is based altogether on the chart and represents a slight expansion of it. In later briefs, each of the functions and uses of lime will be presented in detail.

Accompanying this brief is a chart 17 in. long by 8½ in. wide, showing some of the many functions and uses of lime.

A Correction

IN the June 3 issue of Rock Products appeared the article, "Handling Potomac Sand and Gravel." In describing the recently constructed sand and gravel plant built at Washington, D. C., by L. E. Smoot, we omitted to say that the crane installed on the west side of the storage bins was the "Ohio," manufactured by the Ohio Locomotive Crane Co., Bucyrus, Ohio.

Accident Prevention

Safety by Use of Compressed Air Machinery and Equipment—II

CASES have been known where there have been slight explosions or where the oil has burned in the pipe line, without any serious results other than the formation of the line of carbon monoxide. It is reported that men have lost their lives from breathing carbon monoxide that has come through the compressed air line. This possibility makes it advisable to provide good ventilation at the places where compressed air is used. There is also a possibility that the carbon deposit may be distributed in such a way that it will form a dust which mixed with air and, ignited, may explode and do serious damage.

It is particularly objectionable to have carbon deposited around the compressor discharge valves. It prevents the valves from closing fully and on the intake stroke some of the compressed air rushes back into the air cylinder. This not only decreases the efficiency of the compressor but it may also cause serious overheating, thus increasing the danger of fire and explosion. The compressed air which rushes back through the leaky valves is considerably hotter than the air drawn in from the atmosphere at the intake valve. This means that at the end of each compression stroke the temperature in the cylinder is somewhat higher than if the valves were tight. This temperature is still further increased by the friction of the air churning back and forth through the partly closed valve openings.

To prevent the formation of excessive carbon deposits it is advisable to feed the lubricating oil into the air cylinder slowly and to use only a high grade mineral oil. In spite of these precautions it is necessary to clean out the cylinder, valves, discharge pipe, and receiver at regular and frequent intervals—perhaps once a week, although the intervals may be shorter or longer depending upon the operation of each installation. For this purpose many operators feed soapy water into the air cylinder for two or three hours at a time. They use 1 lb. of soft soap in 7 or 8 ft. of water and feed this into the cylinder about 10 times as fast as the oil is ordinarily supplied. In addition to this soap water treatment, some authorities recommend the use of a lye solution which should be fed into the discharge pipe and not into the compressor. One pound of lye may be dissolved in 8 to 10 qt. of water and fed through a sight-feed lubricator at the rate of about 60 to 70 drops a minute. Operators should make sure, however, that after using either the soap or lye solution, the air tank is drained and the compressor operated for a short time with the regular oil lubricant; otherwise, the compressor and other equipment may start to rust.

In cases where the carbon is unusually hard and cannot be removed by the soap or lye solution, it becomes necessary to scrape off the carbon with a hand tool. Under no circumstances should kerosene or any other flammable substance be used to soften the carbon; there is danger that they may volatilize and form explosive mixtures and do considerable damage after the compressor is started up again.

Clean Air at Intake—There is a possibility that a fire or explosion may occur in the compressor or air equipment resulting from the ignition of a flammable substance that may be mixed with the air drawn in at the intake. The intake, therefore, should be located at a place where the air is as pure and clean as possible. Particular care should be taken to prevent the intake of gas or the fumes from gasoline or other flammable liquids. Sometimes screens or air filters are installed to remove wood dust, coal dust, soot from smoke, and other foreign materials from the air drawn into the compressor.

The air intake pipe should be so installed that there will be no pockets for the accumulation of oil, water, or other foreign substances. These accumulations are objectionable because they decrease the area of the intake pipe; they may also be drawn periodically into the air compressor where serious trouble may result. If the intake pipe has pockets where such substances accumulate, provision should be made to drain them off at frequent, regular intervals.

Temperature in Air Cylinder—Every effort should be made to reduce the temperature in the air cylinder. This will assist materially in decreasing both the volization and decomposition of the lubricating oil, thus reducing the danger of fire and explosion. To accomplish this, most air compressors are water cooled; provision is made to draw into the compressor air that is as cool as possible; and care is exercised to see that the compressor is not operated at a speed greater than that recommended by the manufacturer.

In cooling air compressors cold water should be used from a source that is not likely to fail. A small pond or tank for emergency use are desirable particularly where air is being supplied to mines or tunnels. In order to make sure at all times that the water is circulating, many operators arrange their installations so that the water is visible as it flows from the discharge end of the cylinder water jackets. As in steam boilers, however, deposits of scale and other foreign substances often form on the wall of the water jacket, thus reducing materially the cooling effect of the water and permitting the cylinder to become hotter than usual. In loosening and removing these deposits, it is often advisable to fill the water jacket with a hot solution of caustic soda or some other suitable substance. When handling caustic soda, however, operators should be careful to avoid caustic burns.

(To be continued)

Hints and Helps for Superintendents

A Home-Made Wagon Loader for Sand and Gravel Pits

FOR stripping overburden and for wagon and truck loading purposes, a practical home-made device is utilized at the sand and gravel pit of Fred Hillquist, at Geneva, Ill. This device consists of a

Bucket elevator showing method of chain drive

series of elevator buckets mounted on double-strand chain which runs over a series of sprockets. The sprockets, shafts and supporting timbers are attached to an old automobile chassis, being bolted on the rear end and supported by an A frame at the front end.

The A frame is of such a height that the buckets while carrying the load are practically horizontal and that on the return they have the proper digging angle.

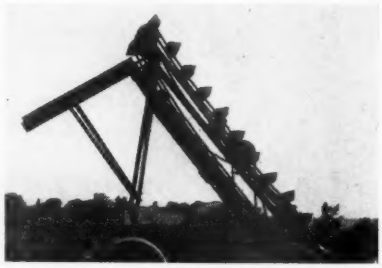
The elevator buckets discharge to a spout or pan which is supported from the A-frame by angle-iron brackets.

In constructing this loader the universal from the motor of the automobile was removed from the differential and by means of a bevel gear and pinion drives the main sprocket shaft, which is bolted on to the chassis.

An 8-in. sprocket on the main shaft is connected by chain drive to another 8-in. sprocket at the 5-ft. centers over it and directly above it.

The second sprocket on the shaft is mounted on the supporting timber of the bucket elevator and it drives another shaft to which, on the other side of the supporting timbers, is another 8-in. sprocket driving the main bucket-elevator sprocket by chain drive. The distances between these two sprockets is 6-ft. The buckets proper run over a series of 4-ft. sprockets. The distances between the head and tail end sprocket is 20-ft.; there are 26 elevator buckets. The A frame and supports for the pan are made of 2-in. angle iron.

As the machine is constructed it is not



Here is the bucket elevator as mounted on the automobile chassis showing A-frame support and angle iron brackets for discharge spout

self-propelling, but it can be made so by a simple arrangement. A sprocket or two would have to be attached to the main sprocket shaft and, also two sprockets directly opposite would have to be attached to the rear axle of the automobile. These sprockets would have to be clutch-connected so that if it is desired to propel truck the clutches will be thrown in and the power would be derived by chain drive from the main sprocket shaft.

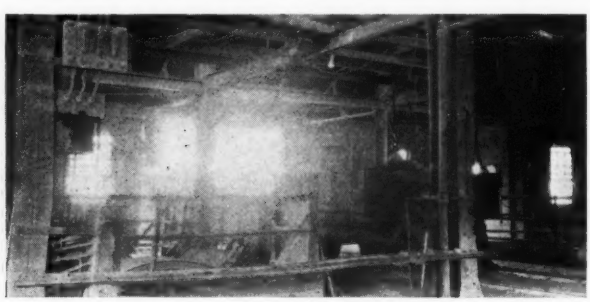
Transfer Table for Returning Empty Cars

AT the crushing plant of the Sandusky Portland Cement Co., Dixon Ill., a rather novel method is employed for transferring empty cars out of the crusher house. This house is situated about a mile from the quarry and the rock is brought to its entrance in 6-yd. side-dump cars by a steam locomotive. The crusher house has two entrances, the loaded cars entering on one side and the empty cars leaving on another. Therefore, after the loaded car has been dumped the empty cars are transferred to the other side by means of transfer table.

A hoist pulls the loaded cars in from the entrance and spots it directly in front of a 48x60-in. jaw crusher. Two vertical compressed-air hoists equipped with grappling hooks are hooked on the side of the car and the contents are dumped. After the dumping operations the cars are righted and the same hoist then pulls the empty car to a transfer table, the track of which runs at right angles with the main entrance track. The transfer table is turned by a wire rope running over a windlass and pulleys and the car can be pulled in either direction. The head pulley is direct driven by a motor.

To transfer a car the operator starts the motor which runs the windlass. The motor is reversible. Having transferred the car to the opposite end, it is put on the empty car track which is parallel to the main entrance track by a compressed air ram, the valve of which is operated by the hoist attendant. The ram has sufficient force to shove the car from the transfer table and also to push the entire line of cars on the empty track clear out of the crusher house.

The main hoist, transfer table controls, and the compressed air ram are operated by one man. One man also attends to



Here is where the grappling hooks are attached to the car preparatory to dumping the load into the jaw crusher

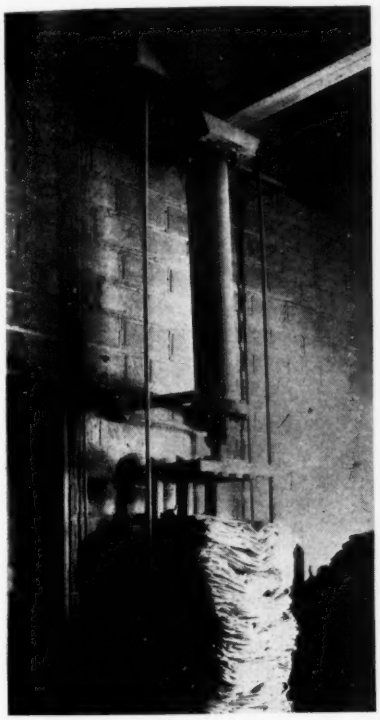
The loaded cars are run in the crusher house as shown, are transfered, after being dumped, and return empty on the tracks to the right

unhooking the cars and dumping them into the jaw crusher.

The two vertical compressed-air hoists which dump the cars are mounted on an overhead traveling crane and can be used for repairs and the placing of machinery in the crusher house as well as dumping of cars.

Baling Empty Cement Bags

AT the bag house of the Sandusky Portland Cement Company, Dixon, Ill., a compressed-air ram is utilized for baling empty cement sacks. The empty sacks are received in this department and are first put through the large revolving cage which cleans out all the dust. This dust is reclaimed and sent back to the warehouse for loading.



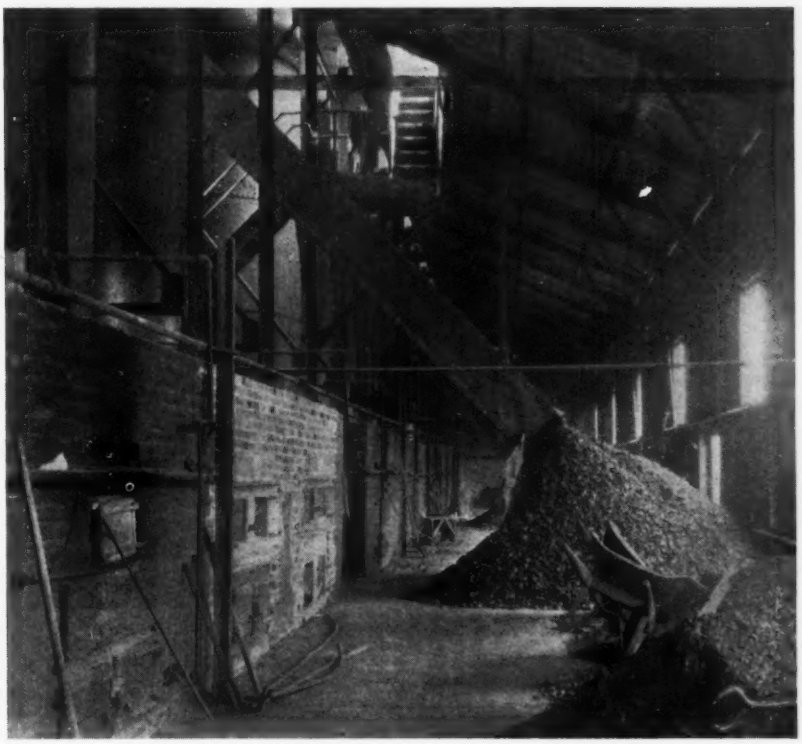
Baling 100 empty cement bags by compressed-air ram

After the cleaning process the bags are taken out of the cage and are put on a sorting table where all the foreign bags are removed and the torn bags sent to the repair department. The good bags are put on a table; when 100 bags have been counted out they are trucked away to a platform under the compressed-air ram as shown in the accompanying picture. The operator simply pulls a lever and the ram presses the 100 bags into a tight bale. The operator then ties the bags together and they are then trucked away to the bag-storage department. This method of baling is simple and efficient and does away with a lot of unnecessary labor. At this plant two such rams are used.

Distributing Coal for Lime Kilns on Firing Floor

AT the Kelley Island Lime and Transport Co.'s Marblehead plant coal is brought over for the kilns on the same trestle that is used for bringing rock for the kilns from the quarry.

The coal is put on side-dump cars and is hauled up the incline leading to the top of the kilns. Between the kilns is a coal chute or pocket and the contents of the car are dumped into this pocket. The chute at the firing floor branches out into a Y, so that the coal is put in two piles, each of the piles serving several kilns.



How the Kelley Island Co. distributes its coal for the lime kilns

Safety Code for Conveying Machinery

AN important step toward the solution of an accident problem has just been accomplished through the decision of the American Engineering Standards Committee that the development of a safety code for conveyors and conveying machinery be undertaken.

The introduction of mechanical conveyors in many industries has eliminated a large proportion of the accidents resulting from the manual handling of materials. At the same time, it has introduced new hazards, many of which can be prevented by a more general agreement among both users and manufacturers of conveying equipment as to safe practice in the manufacture, installation and operation of such equipment.

The A. S. M. E. and the National Bureau of Casualty and Surety Underwriters are joint sponsors for this code. All interested national organizations will be asked to co-operate in its formulation. This code will be intended as a guide for the safe operation and maintenance of conveyors and conveying machinery coming under the following main divisions: gravity, belt, chain, flight-bucket, apron, screw and jigging conveyors, car hauls, aerial cableways, overhead trolley and pneumatic tubes.

All shafting, pulleys, belts, link belts, chains, gears, sprockets, couplings, clutches, etc., used on and in connection with conveyors and conveying machinery will be covered in the mechanical power transmission code now in preparation.

From Stone to Gold

JAMES SAVAGE, of the Buffalo Crushed Stone Co., returned recently from a trip into northern Canada, where he has some gold claims. He promises to have some time a gold mine to which he will take his friends on a visit.

Quarried from Life

By Liman Sandrock

Your Friend Mac—and Ours

WE are starting this story by paraphrasing Fitz-Greene Halleck's fine lines: "None know thee but to love thee, none name thee but to praise." And to the letter that's H. H. Macdonald—Mac of the Gypsum Industries Association. But this same lovin' cus is mighty gunshy of self-publicity, let me tell you. He's one shrinking violet when it comes to tooting his own saxophone, allowing that a violet can toot.

Mac will thrill you with oratory when you mention the Gypsum Association or his sworn pals, Virgil Marani and Prof. Olson, or, best of all, his home side-partner and their four wonderful kiddies. About himself, he's a clam with the shell closed.

"Mac," we began, "you were assistant to good ol' Daddy Blair of the Brick Association some years ago. Tell me how"—

"Say, Liman, I wish you could hear my boy Jack play the piano," he came back.

"Fine, but how did you"—

"And when I get home at night and the little lady and our kiddies get togeth"—

Now what can a poor scribe do with a fellow like that? However, we did manage to corral a close friend who was eager to loosen up and tell us some of the things that go to make up this story.

In 1906 Mac was an Associated Press night editor in San Francisco when the fire broke out, and he gained the everlasting gratitude of his chief by saving the contents of that chief's desk. (Only the good God and an editor know how valuable are the contents of an editor's desk, and only that editor knows what that junk is all about.) Yes, and he wired the East the first news of that terrible disaster, from Oakland.

Four years later, Mac was on the Cleveland *Press* doing the political stuff, the courts, and the like. It was here that the National Paving Brick Manufacturers' Association learned of his capabilities and engaged him as assistant to Secretary Will P. Blair, and for seven years he was Mr. Blair's right-hand man. Here are a few of the fine things the association said of Mac in its magazine, *Dependable Highways,* when he sought new fields to conquer:

"Throughout his connection with the paving brick industry Mac has, by his genial nature and unbounded enthusiasm, made a warm place for himself in the esteem of his associates and all others with whom he has come in contact. His going is a distinct loss to the industry as expressed by the resolutions passed at the annual meeting.

"He has given us a high standard of efficiency and alertness seldom known in positions requiring like service. His every act has been one of kindness, courtesy, and helpful service to the association and to those with whom he came in daily contact."

That's Mac!

His hobbies are Home and the Gypsum Association—just two. But, as we said before, his daggone modesty forbids him taking any place for himself in the big spot the

H. H. Macdonald, secretary of the Gypsum Industries Association

association now has in the industry's sun, and he lays it all to the work of his associates and the membership in general. Today, this association has fellowship in the U. S. Bureau of Standards, five fellowships in state agricultural universities; has given wide publicity to its work in all the big magazines and the daily press throughout the country; has in Virgil Marani and Professor George A. Olson an engineer and a chemist who, through their ability and energy, are true apostles of the gospel of gypsum, and are spreading it to the four winds of heaven.

Even the teamwork of the home office is wonderful to behold. Why, down there in the Conway building, the typewriter repair man is called by his first name.

The membership of the association is behind this live office to a man, and all because it knows that its affairs will always be well administered, its interests conserved, and its future visualized from the broad standpoint of service—and yet more service!

Drop in those offices some near day and find this out for yourself. You'll get a reception that will warm the cockles of your heart and give you fine food for thought if you are mentally hungry. Rock Products lifts its hat to the Gypsum Industries Association—and to Mac!

"Old Ben," Catalina's Agstone Wonder

POSTMARKED Avalon, Calif., comes a postcard from A. P. Sandles on which is depicted "Old Ben, pet seal of Catalina." This cus—meaning Ol' Ben—looms up to eclipse the shoreline of Catalina island and blots out the whole Pacific ocean and most of the sky—he's that big apparently.

Quick to see the advertising possibilities in the said Ben, A. P. promptly informs us that "Ben was fed on Agstone—two tons per acre." Gee, if this man ever goes to N'Yawk, he'll cop off old lady Liberty on the Bartholdi statue and then tell us that she's "enlightening the world" with a hunk of phosphorescent Agstone in her fist. Goshalmity!

"Zip-Zip Service"

THIS zippy title adorns the snappy four-page "weekly" gotten out by the Columbus Consumers' Supply Co., of Columbus, Ohio. Its purpose, in the words of the company, is "to entertain you and post you down to the minute."

It's a company uplifter. It puts the crab and the grouch in the discard and butters the workaday bread with a smile. It may be oily and soapy when it asks: "May I hold your Palm Olive? Not on your Life Buoy." But at all times it administers light and palatable corrective doses for sour stomach and turns the mouth corners upward and outward. "Hold up your head and keep smiling" is the panacea for the working day evils that may attack the Columbus Consumers' family. More power to Zip-Zip!

They Said It

GEORGE OTIS SMITH, director of our country's Geological Survey, comes back at the coal operator whose plaint is "less government in business" by advising that he, the c. o., "put more business in business."

Chemical and Metallurgical Engineering headlines an editorial which seemingly pities the potash industry with "Alas, poor Potash, I knew him well." Could the editor have meant poor Purlmutter? Oi, oi!

DETROIT NEWS: A remarkable mountain of desert sand in the Southwest was wont to play heck with the pioneers of '49. Strong winds so changed its position over night that many, directed by the settlers who passed before, would go wrong and lose their way. Even today a mountain of sand will sometimes make a producer go wrong and lose—his business.

Editorial Comment

Governmental Competition

Government ownership and operation of public and quasi-public utilities may have worked well in European countries, but in America similar experiments have succeeded only infrequently. This is true of lighting, transportation, and other facilities upon which practically the entire population of a community must depend.

It is still more true that a state or municipality seldom succeeds when it attempts the production of materials for its use in competition with materials furnished by commercial producers. There is lacking in any governmental enterprise the element of profit which is present in any commercial enterprise and which obliges that plant to be efficient if it is going to live. To be sure, the city or state which attempts production will pay no item of profit to the commercial producer, and it may even appear that the materials are being produced at low cost. More than likely, however, a good cost system on the governmental operation taking account of every element of production cost would show that similar material sold at a profit by another producer would still cost less than that produced by the governmental agency.

There are cases, of course where the nature of the product, the size and frequency of demand for it, the distance from market to source of supply, or other conditions make it an unprofitable product for a commercial producer to supply at almost any price, and the city or state is forced into the manufacture of such a product. But in most cases the source of supply which in the end will prove most economical to the taxpayer is the commercial producer, and the commercial producer should not hesitate to use such sound arguments in discouraging governmental production where commercial products are available at prices that will mean savings for the community concerned.

New Uses for Stone

Often a potential market for various rock products exists which might readily be developed into an actual market. Sometimes a use of stone or gravel or cement in one place suggests similar uses elsewhere.

Take a current example of a city of about 175,000 inhabitants, where a new filter for sewage disposal is being constructed. The city will use 300,000 yd. of stone in the new construction—enough to keep a 500-yd.-a-day plant busy for nearly three seasons. Because of a high freight rate from the nearest source of supply, the city decided to build its own crushing plant to furnish the stone. Perhaps the decision was a wise one; however, it would probably be difficult to prove the saving which may result.

To stone producers the value in this information lies in the fact that the type of disposal plant and filter used is one suited to many communities, anywhere from one a tenth the size of this city to one ten times its size. Perhaps your community really needs this more modern method of disposal, but has not yet sufficiently realized the need. With a little investigation on your part it may be possible to convince the authorities of this need. There is certainly nothing unethical in advocating such a change which benefits the entire community, merely because it may improve your own business. And once the change is decided upon, there is no reason for being modest and refusing to take a reasonable profit on the stone which you may supply.

Few communities are so situated that they would construct their own crushing plants; it is the city's object to place the stone on the filter with as low a total cost as possible, and in nine cases out of ten that would mean stone supplied by a commercial producer.

The lesson does not apply to filters alone. Frequently new and unusual uses for stone are being found; to introduce similar uses in your community is a progressive way of increasing your business.

Time to Act

The seriousness of the coal situation may have been realized by cement, lime, gypsum, and stone quarry operators, but their realization has brought forth little concerted action toward relief from the situation which has been increasingly acute during the past three months. But if these producers whose business depends so much on an adequate supply of coal at a reasonable price have seen the possible consequences, it is certain that the general public, which is almost as seriously concerned, has failed to be greatly disturbed.

The time has come, however, when we must all awaken to the seriousness of the consequences of any continuation of the coal strike, and demand that the federal government, the only agency empowered to act in such a situation, take steps to insure the safety, the welfare, and the business of the millions of common people who are bound to suffer the consequences even of the three and a half months of strike already past. The railroad strike only adds to the seriousness of the situation.

It is time to wake up. Rock products producers are logical leaders in arousing their communities and directing public opinion to demand a settlement that will insure adequate coal at reasonable prices.

New Machinery and Equipment

A New Gas Shovel

THERE is announced by the Northwest Engineering Co., Green Bay, Wis., a new Northwest gas shovel. Because of its sturdy simplicity and unusual range of utility this shovel, states the company, is expected to find wide application for the general contractor, the road builder and particularly in quarries.

Cleaning up a quarry floor

The device is an adaptation of a new and, according to the manufacturer, a revolutionary shovel mechanism to the Northwest crawler crane. This crawler device is depended upon to give the shovel ideal mobility. Incorporated in the crawler is the patented Northwest steering device which make the device "as easy to steer as a truck." The shovel travels at a good rate of speed to and from the job without taxing the motor and, being operated by a gas engine, no stops to get up steam are necessary.

The outstanding features are unequaled simplicity combined with particularly powerful crowd, accomplished without the usual gear mechanism or rack and pinions and without separate crowding engines or auxiliary driving apparatus of any kind. The arrangement of cables and sheaves, which eliminates gears and auxiliary drive for crowding or pulling up the dipper stick, is shown in one of the illustrations. Line *A* is operated from the left-hand drum and is the hoisting line. It passes through the padlock sheave on the dipper and is dead-ended on the large side of a compound drum near the head of the boom. Line *B* is operated from the right-hand drum, passes through a sheave on the dipper shaft, and is dead-ended near the dipper. A third line, *C*, is dead-ended on the small side of the compound drum at the head of the boom, passes once around an independent sheave on the dipper shaft and is dead-ended near the upper end of the dipper stick. A novel feature is found in the fact that line *C* is not operated by any hoisting drum; careful study will reveal how any combination of hoisting, lowering and thrusting in or out is accomplished with this simple rigging.

With the brake set on drum controlling line *B*, line *A* is pulled in. The dipper moves in the arc of a circle of which the dipper shaft is the center. If it is desired to crowd farther into the bank or to move the dipper farther out to load a wagon, etc., release the brake slightly on line *B*. The action then is that line *A*, pulling on the large side of the compound drum, puts a greater pull on line *C*, which is dead-ended on the small side of the compound drum. This pull on line *C* then forces the dipper stick outward. Conversely, if it is desired to thrust inwardly, releasing the brake on line *A* and hoisting line *B*, produces this effect. The manufacturer says that since the line *C*, which effects the thrust is actuated by the hoist, a crowding effect equal to the full power of engine is secured. The manipulation is particularly simple, as it is merely necessary to pull in on the hoisting cable *A* to produce simultaneously a powerful hoisting and crowding effect.

The range is this gas shovel is also shown. It will grade to a 30-ft. flat width, 4 ft. below grade and handles a ¾-yd. dipper without taxing the engine, which develops 50 hp. at 800 r.p.m., thereby providing ample margin of reserve power. The shovel has all railroad clearances for shipment anywhere without dismantling, the travel ability and power to load itself on a flat car, and is ready for instant operation upon its arrival.

The shovel attachment can be applied to the Northwest crane or dragline by simply

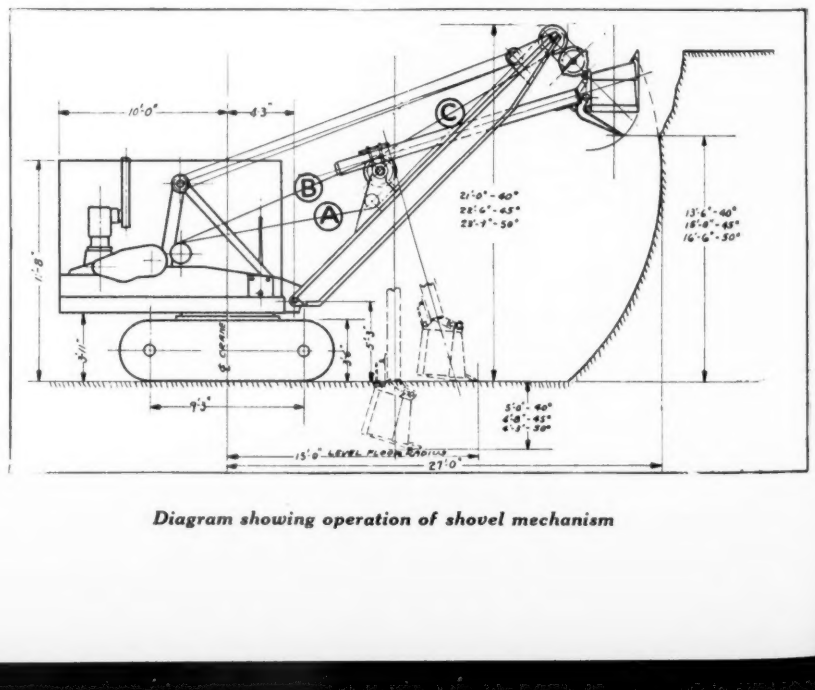


Diagram showing operation of shovel mechanism

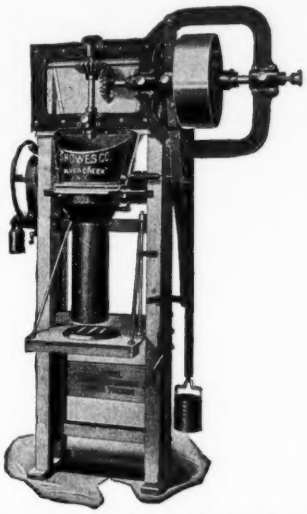
laying down the crane boom and mounting the shovel boom. No change in the machine itself is required. The change has been repeatedly made in three hours.

The accompanying photograph was taken in a quarry during the extensive test in the field. It shows the Northwest shovel cleaning a quarry floor and the thoroughness with which the shovel has done its work.

Automatic Friction-Driven Packer

THE Iron King packer, manufactured by the S. Howes Co., Inc., Silver Creek, N. Y., is adapted to a wide range of work, says this company, for it will handle easily and rapidly any material, pulverized, granular or fibrous, that can be compressed into a container. It is especially adapted for packing cement, lime, plaster, kaolin, talc, etc.

As will be seen from the illustration, the heavy maple frame is assembled to form a solid unyielding unit. A one-piece



An automatic friction-driven packer for compressing rock products materials

webbed casting of immense strength carries all four bearings, having extra long journals cast integral with the iron front, thus insuring rigidity and alignment of the two shafts, besides preventing undue wear of the bevel gears. The friction clutch is of the simple cone type, faced with thermoid and bronze bushed. This combination makes a drive that releases instantly and engages gently. A full complement of compression grease cups provides for lubrication of shaft bearings and friction clutch and the special auger equipment packs evenly and quickly without undue friction. The carriage which supports the barrel or other package is strong, well-braced and suspended by heavy steel chains passing over sleeves of large diameter, and to eliminate unnecessary friction is provided with rollers which run on steel guides. The device used for raising the platform consists of a non-stretchable belt rolling over a double flanged pulley and connected with a heavy weight.

A uniform weight in each barrel or sack is made possible by an adjustment attached to the brake-lever. By slightly moving a weight, more or less material as desired can be compressed into the package. About all the attendant has to do is to put on the empty sack or barrel and take off the filled packages. The empty barrel is placed on the platform and the latter ascends to its proper position by slighty raising a lever. The friction clutch is then thrown into contact by pushing a second lever; packing now begins. The platform gradually recedes with the accumulating weight in the package and as soon as the latter is filled an adjustable trip disengages the clutch, shuts off the power and the platform descends to the floor. The filled package is then ready for removal.

The height of this packer is 9 ft. 8½ in.; width, 5 ft. 6 in.; depth, 3 ft. 3 in.; height center drive pulley, 8 ft. 2 in.; speed, 175 r.p.m.; bevel gear on upright, 35 cogs; pinion on countershaft, 26 cogs; size of hopper, inside 14x24 in.; size of drive pulley, 24x7½ in.; shipping weight, 1950 lb.

Automatic Loader for Handling Materials

THE accompanying illustration shows the Model 42 loader put on the market by the Barber-Greene Co., Aurora, Ill. The following claims are made for it:

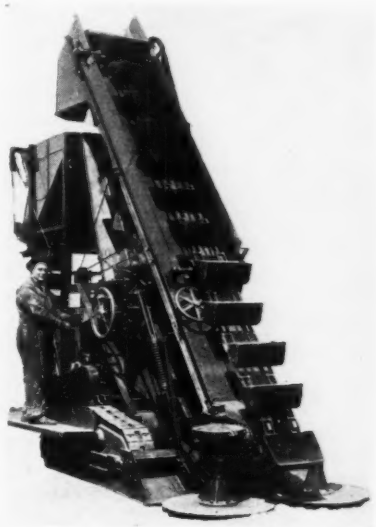
It measures any amount up to a maximum of 21 cu. ft. and has gate closed by gravity which can be opened from the operator's platform. Structural sections are used throughout, built up of heavy angles and channels riveted together and designed for strength and accessibility. All units mounted on the frame may be reached and adjusted without removing any other part.

One man operates the loader easily. The gears are shifted for various speeds as in a truck; two levers control the crawlers, and a third the elevator. The governor regulates the engine speed automatically.

Cotta truck transmission is employed, gears running in an oil case bolted direct to the engine. The gears and shafting are alloy steel heat-treated and oil toughened and the shafts are mounted in oversize ball bearings. The full length continuous treads are 60 in. long by 10 in. wide and there is a special design for cleaning links. The drive chains are high-grade, 2 in. pitch Diamond chain. The crawlers readily accommodate themselves to rough ground.

The operator rides with the machine, controlling it as easily as if it were an automobile. All of the levers are within easy reach from the platform.

Complete protection from mud and dirt is provided by a tight housing about the moving parts of the crawler, and the special hub has a bolt which breaks when too much strain is put upon the crawlers. The combination scraper and shoe as-



A 25-bucket automatic loader

sures practically 100 per cent pick up and at the same time carries the weight of the elevator and takes the thrust from the digging end. High skirt boards protect the operator and the machine from any material falling from the buckets.

The specially designed hub and sprocket are held together by a bolt which breaks in case the bucket or discs meet with an obstruction and a new bolt can be installed in 2 min. A hand wheel adjusts the elevator to the desired digging level or raises the discs off the ground for traveling. By this hand wheel the digging edge of the discs may be moved up or down, causing them to dig in if the edge is down or to ride out of the material if the edge is raised.

There are 25 buckets, 20x9 in., spaced 18 in. apart. Most of the weight of the elevator and digging end is carried by the combination scraper and shoe. Part of it, however, is counter-balanced by these heavy springs. The bevel gears are protected by oil-tight housing which keeps out dirt and prevents excessive wear. The patented rotary disc feeder rotates toward the center, carrying the material to the buckets and keeping them filled.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00		1.50	1.25	1.25	1.25
Coldwater, N. Y.	1.50 per net ton all sizes; fluxing stone 1.80 per ton					
Eastern Penna.	1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	1.00	1.15	1.15	1.15	1.15	1.15
Prospect, N. Y.	.75	1.25	1.25	1.25	1.25	
Walford, Pa.		1.30			1.30	
Western New York	.75	1.20	1.20	1.20	1.20	1.20
CENTRAL						
Alton, Ill.	1.75		1.40	1.35	1.35	
Buffalo, Iowa	.90		1.20	1.00	1.05	1.05
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Faribault, Minn.					1.75	
Greencastle, Ind.	1.25	1.10	1.10	.90	.90	.90
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50
Krause or Columbia, Ill.	1.40	1.20	1.35	1.20	1.20	1.20
Lannon, Wis.	.85		.95		.85	.85
Mitchell, Ind.	.80	.80	.80	.80	.80	.80
Montreal, Canada	.85	1.20	1.10	1.05	1.00	
Montrose, Ia.	1.25	1.55	1.65	1.55	1.50	
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.00
Sheboygan, Wis.	1.05	1.10	1.05	1.05	1.00	
Southern Illinois	1.40	1.30	1.40	1.40	1.40	
Stolle, Ill. (I. C. R. R.)	1.30		1.25	1.35		
Stone City, Iowa			1.40	1.30	1.25	
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
Waukesha, Wis.			Prices include 90c freight all sizes .80 per ton			
SOUTHERN:						
Alderson, W. Va.	1.10	1.35	1.65	1.35	1.35	
Bromide, Okla.	1.50			1.50	1.50	
Cartersville, Ga.		2.00	1.40	1.25	1.25	
Chickamauga, Tenn.	.90	1.00	1.00	1.00	.90	
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00		
Ft. Springs, W. Va.	1.00	1.30	1.40	1.25	1.15	
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	
Ladds, Ga.	2.00	2.00	2.00	1.50	1.50	1.50
Morris Spur (near Dallas) Tex.	1.00	1.25	1.25	1.25	1.25	1.00
WESTERN:						
Atchison, Kans.	.90	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50		1.50	1.50	1.25	
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	
Branford, Conn.	.60	1.50	1.25	1.15	1.00	
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	
Dresser Jct., Wis.	1.25	2.25	2.25	2.00	1.50	1.50
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.40@1.50	1.30@1.40	1.50
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	
Eastern Mass.	.60	1.85	1.60	1.50	1.50	1.50
Eastern New York	.75	1.60	1.60	1.40	1.40	1.40
Eastern Penna.	1.25	1.70	1.60	1.50	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50	1.25	1.15	1.00	
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*		1.75*	1.50*	1.50*	
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	1.75	2.10	1.80	1.75	1.60	1.60
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Columbia, S. C.—Granite			1.75@2.00	1.75	1.60@1.75	
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	.85	1.60	1.55	1.40	1.35	1.35
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.30	1.30
Ft. Springs, W. Va.—Granite	1.00	1.25	1.40	1.25	1.20	
Lithonia, Ga.—Granite	1.00		1.50	1.25	1.25	1.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30		1.20	
Los Angeles, Calif.—Granite		1.25@1.50	1.15@1.40	1.15@1.40		
Macon, Ga.—Granite	.50		2.50	2.25	2.00	1.25@1.90
Middlebrook, Mo.—Granite	3.00@4.00		7.00@7.25	2.00@2.25		1.25@1.75
Sioux Falls, S. D.—Granite	.75	1.85	1.75	1.70	1.70	

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk — **2.50**

Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$—100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk — **3.00**

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$—Raw ground; sacks, 4.50; bulk — **3.00**

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.00; bulk — **2.50**

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk — **3.00**

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk — **3.00**

Williamsport, Pa. — Analysis, 90% $CaCO_3$, 2% $MgCO_3$—50% thru 50 mesh; paper, 4.75; bulk — **3.75**

CENTRAL:

Alton, Ill.—Analysis, 97% $CaCO_3$, 0.1% $MgCO_3$—90% thru 100 mesh — **6.00**

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh — **1.50**

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk — **2.50**

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh — **1.25**

Bettendorf, Ia., and Moline, Ill.—98% $CaCO_3$, 1% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh — **1.11**

Buffalo, Ia.—90% thru 4 mesh — **1.00**

Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$—50% thru 100 mesh — **1.50**
90% thru 4 mesh, cu. yd. — **1.35**

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh — **1.00**

Columbia, Ill., near East St. Louis—½-in. down — **1.25@1.80**

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh — **1.80@3.80**

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh — **1.25**

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh — **2.00**

Kansas City, Mo.—50% thru 100 mesh — **1.50**

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh — **1.40**

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh — **2.00**

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$—50% thru 100 mesh; bags, 4.50; bulk — **3.00**
90% thru 4 mesh — **1.25**

Milltown, Ind. — Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$—40.8% thru 100 mesh, 61.2% thru 50 mesh — **1.40@1.50**

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$ — 90% thru 100 mesh — **1.25**

Montrose, Ia.—90% thru 100 mesh — **1.25**

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh — **1.50@2.00**

Ohio (different points), 20% thru 100 mesh; bulk — **1.25@1.50**

Piqua, O.—100% thru 10; 40% thru 50; 70% thru 100 — **3.25@5.00**
99% thru 10; 55% thru 50; 40% thru 100 — **1.75@2.00**

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk — **.80@1.40**

Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ½-in. mesh — **1.30**

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 30 mesh — **.75**

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50
Waukesha, Wis.—No. 1 kiln dried..... 2.00
No. 2 Natural..... 1.75
Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$—90% thru 100 mesh.... 5.00
90% thru 50 mesh..... 1.35
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk.... 4.25

SOUTHERN:

Alderson, W. Va.—90% thru 50 mesh 1.50
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh 2.00
90% thru 4 mesh..... 1.50
Cartersville, Ga.—Analysis, 55% $CaCO_3$, 42% $MgCO_3$—all passing 10 mesh..... 2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$—90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh..... 2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$—90% thru 50 mesh..... 1.75
Hot Springs, N. C.—90% thru 100 mesh, sacks, 4.25; bulk..... 3.00
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh..... 2.70
100% thru 10 mesh..... 2.25
Ladds, Ga.—90% thru 50 mesh..... 2.00
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—X thru 20 mesh; sacks 5.00

WESTERN:

Colton, Calif.—Analysis, 95% $CaCO_3$, 2-4% $MgCO_3$—all thru 14 mesh—bulk 4.00
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md. 2.25
Berkley Springs, W. Va..... 1.75@2.00
Cedarville and South Vineland, N. J.—Damp, 1.75; dry..... 2.25
Cheshire, Mass. ..... 5.00@8.00
Columbus, Ohio—Glass sand..... 1.25
Dunbar, Pa.—Damp 2.00
Falls Creek, Pa. 2.50
Hancock, Md.—Damp..... 1.25@1.75
Klondike and Pacific, Mo..... 1.75@2.50
Mapleton, Pa. ..... 2.25@2.50
Massillon, Ohio 3.00
Michigan City, Ind.—Glass sand..... .40@ .45
Mineral Ridge, O..... 2.50
Green 2.25
Montoursville, Pa. 1.75
Oregon, Ill.—Glass sand..... .75
Ottawa, Ill. ..... .75
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. 2.50
Round Top, Md.—Dry..... 1.25
San Francisco, Cal..... 3.00@3.50
St. Mary's, Pa. 2.25
Thayers, Pa. 2.00
Utica, Ill. ..... 1.00@1.25
Zanesville, Ohio ..... 2.00@2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast..... 4.00
Molding fine and brass molding..... 2.00
Molding coarse 1.75
Allentown, Pa.—Core and molding fine 1.50@1.75
Arenzville, Ill.—Molding fine..... 1.20@1.60
Beach City, O. — Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse..... 2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse..... 5.00
Sand blast ..... 5.00@8.00
Stone sawing 6.00
Cleveland, O.—Molding coarse..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, O.—Core ..... .30@1.75
Sand blast ..... 3.50@5.00
Furnace Lining 1.50
Molding fine 2.00
Molding coarse 1.75
Stone sawing 1.25
Traction ..... .75
Brass molding 2.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1¼ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.60	.60	.60
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	1.10	.95	.85	.85	.85	.85
Erie, Pa.	1.00		1.00		1.25	
Farmingdale, N. J.	.48	.48	1.00	1.00	1.20	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.35	1.35	1.25
Machias, N. Y.	.95	.95	.85	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.15	1.15	.70	.70
Portland, Maine		.50	1.75		1.35	1.35
Washington, D. C.	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.40	.40				.90
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.50			.50	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.75	.75@1.00	.75@1.00	.75
Des Moines, Ia.	.50	.40	1.50	1.50	1.50	1.50
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Farlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.40@ .50	.40	1.25	1.00		.90
Elkhart Lake, Wis.	.60	.54	.70	.68	.68	.60
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Greenville, Mechanicsburg, O.	.65	.65	.65	.65	.65	.65
Hamilton, Ohio		.90			.90	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.					.70	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Libertyville, Ill.		.50		.70		
Mankato, Minn.—Pit Run	.50	.40	.40			1.25
Mason City, Ia.	.65	.55	1.70	1.60	1.55	1.55
Milwaukee, Wis.	1.06	1.06	1.26	1.26	1.26	
Minneapolis, Minn.	.35	.35	1.25	1.25	1.25	1.25
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
St. Louis, Mo., f. o. b. cars	1.10	1.30	1.50	1.30		1.25
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.60	.60	.60	.75	.60	.60
Waukesha, Wis.	.60		All other sizes, .70 per ton			
Winona, Minn.	.50	.40	1.00	1.25	1.00	1.00
Yorkville, Sheridan, Moronts, Oregon, Ill.	.60	.50@ .70		.60@ .80	.50@ .70	.60
SOUTHERN:						
Alexandria, La.		.70			1.20@1.35	
Birmingham, Ala	1.48		all gravel—1.88			
Charleston, W. Va.		1.40				1.50
Estill Springs, Tenn.	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.		2.00		2.00		2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75	1.00	1.50	1.50	1.50	1.50
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.		1.00		1.20		.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90	Washed gravel, all sizes, 2.25			
Roseland, La.		.25	.85	.85		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Los Angeles, Calif.		1.00		1.50	1.50	
Pueblo, Colo.	1.10*	.90*		1.25*	1.50*	1.50*
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25*	1.25*	2.00*	1.25*		1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch	Sand, ¼ inch	Gravel, ½ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)	1.00	1.00		.95		
East Hartford, Conn.			.65 per cu. yd.			
Estill Springs, Tenn.						.85
Fishers, N. Y.	.50@ .75			.50		
Hamilton, Ohio			.40 per cu. yd. in pit			
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Tex.		.95				.60
Janesville, Wis.		.65			.65@ .75	
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.40			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Tex.		.80		1.50		1.30
Winona, Minn.			Clean pit run .50@.60			
York, Pa.		.95@1.20	(crushed rock sand)			

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	2.15	2.15
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.90	.90	.90
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.			1.25	1.25	1.25	1.25	1.25
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05		Other grades 1.45				
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
			(Any delivery in city except team track deliveries)				
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.30	1.50	1.30	1.30	1.30	1.30
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

EASTERN	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
Adams, Mass.			**7.00**					**3.50**
Bellefonte, Pa.			**8.00**	**9.00**	**8.00**		**7.00**	
Berkley, R. I.			**12.00**					**2.30**
Buffalo, N. Y.	10.50	9.00	8.50@11.00	11.00	7.25	9.25	8.00	1.50
Chaumont, N. Y.					**2.50**	**4.00**		
Lime Ridge, Pa.							5.00	
Paxtang and LeMoyne, Pa.					5.00		.....4.75@5.00.....	
West Rutland, Vt.	.....13.50@14.00	11.00@11.50	11.00@11.50	13.50	10.00		11.00	3.50
West Stockbridge, Mass.			15.00					
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		10.50	10.50	10.50	10.50		7.50	1.65*
CENTRAL:								
Cold Springs, Ohio	10.50	9.00	8.50		7.25	9.25	8.00	
Delaware, Ohio	10.50	9.00	8.00	10.00			8.00	1.50
Gibsonburg, Ohio	10.50	8.50	8.50		7.25	9.25	8.00	
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70*
Luckey, Ohio	10.50	9.00	8.00				8.00	
Marblehead, Ohio	10.50	9.00	8.50	11.00	7.25	9.25	8.00	1.50*
Mitchell, Ind.		11.00	11.00	11.00	9.50		8.50	1.45
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50	9.00	8.50	11.00	7.25	9.25	8.00	1.50
Woodville, O. (dlrs.' price)	10.50a	9.00a	8.00a	10.00a	7.25		8.00	1.50
SOUTHERN:								
Erin, Tenn.							6.00	1.00
Karo, Va.							**7.00**	**1.30**
Knoxville, Tenn.	22.00	9.50@11.00	9.50	10.50			7.50	1.30
Ocala and Zuber, Fla.	12.50			12.00			11.00	1.65
Sherwood, Tenn	11.00	9.50			7.50		**7.50**	
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00				**19.70**	
Kirtland, N. Mex.							**12.50**	
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.15*
Tehachapi, Calif.							**13.00**	**2.00**

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dresden, O.—Core and traction	1.00
Molding, fine and coarse	1.25
Brass molding	1.50
Dunbar, Pa.—Traction, damp	**2.00**
Dundee, O.—Glass, core, sand blast, traction	**2.50**
Molding fine, brass molding (plus 75c for winter loading)	**2.00**
Molding coarse (plus 75c for winter loading)	**1.75**
Eau Claire, Wis.—Core	1.00
Sand blast	3.25@3.75
Falls Creek, Pa.—Molding, fine and coarse	**1.75**
Sand blast	**3.00**
Traction	**1.75**
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	**2.00**
Molding coarse	**1.75**
Brass molding	**2.00**
Greenville, Ill.—Molding coarse	1.00@1.40
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and looting clay	.60@ .80
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and fine, stone sawing (pit run)	1.75
Klondike, Pacific and Gray Summit, Mo.—Molding fine and core	**1.75@2.00**
Mapleton, Pa.—Glass sand, core, furnace lining, molding fine and coarse; dry, 2.50; damp	**2.00**
Massillon, O.—Traction, molding fine and coarse, furnace lining, core	**2.50**
Michigan City, Ind.—Core, traction	.40@ .45
Mineral Ridge, Ohio—(Green) core	2.25
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding	2.00
Montoursville, Pa.—Core	1.50@1.75
Traction	1.00@1.25
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	**2.00**
Molding coarse	**1.75**
Oregon, Ill.—Core, furnace lining, molding fine and coarse, traction	**.75**
Brass molding	**.75**
Sand blast	**3.00**
Ottawa, Ill.—Core, furnace lining, steel molding	1.00
Roofing sand	.75@3.50
Sand blast	3.50
Ottawa, Minn.—All crude silica sand	**.75@1.25**
Pelzer, S. C.—Glass sand (carload lots only)	**.70**

Miscellaneous Sands

(Continued)

Rockwood, Mich.—Core, damp	2.00
Roofing	2.50
Sand blast	**3.75**
Round Top, Md.—Glass sand	75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	.00@3.50
Direct from pit.	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Thayers, Pa.—Core	**1.75**
Furnace lining	1.00
Molding fine and coarse	**1.25**
Traction	**1.75**
Utica, Ill.—Core	.60@1.00
Furnace lining	.50@1.00
Molding fine	.50@1.00
Roofing sand	1.00
Sand blast	2.50
Stone sawing	1.00@2.50
Traction and brass molding	1.00
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.50) dry	**2.00**
Traction (dry)	**2.00**
Zanesville, Ohio—Brass molding and molding fine	1.50@1.75
Molding coarse	1.25@1.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude Talc	3.50
Ground talc (20-50 mesh), bags	10.00
Cubes	50.00
Blanks, per lb.	.07
Chatsworth, Ga.—Crude talc	7.00
Ground talc (150-200 mesh); bags	12.00
Pencil and steel workers' crayons	1.50@ 2.50
Chester, Vt.—Ground talc (150-200 mesh)	7.00@ 9.00
Emeryville, N. Y.—150-200 mesh; bags	14.75
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@ 3.50
Ground talc (20-50 mesh)	5.75@ 6.00
(150-200 mesh) bags	8.75@12.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50; (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	**10.00@15.00**
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	15.00@20.00
(150-200 mesh) bags	16.00@40.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton	
Centerville, Tenn—B.P.L. 72% to 75%	**6.00@8.50**
B.P.L. 65%	**6.00**
Gordonsburg, Tenn—B.P.L. 70%-72%	4.00@5.00
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	**7.00**
Mt. Pleasant, Tenn.—Analysis, .70 B.P.L. (2000 lbs.)	**6.50**
Montpelier, Idaho—70% B.P.L.—Crude	**4.75**
Crushed 2-in. ring and dried	**5.00**
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	**4.00**
Wales, Tenn.—B.P.L. 70%	**7.75**
Per 2000-lb. Ton	
Barton, Fla.—Analysis, 50% to 65% B.P.L.	**3.50@6.00**

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x11	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x 7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50.

(Continued from preceding page)

Ground Rock

Centerville, Tenn.—B.P.L. 65%	6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65 to 70%	5.00@6.50

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	20.00	9.00@14.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	12.00@25.00	12.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	28.50@30.00	20.00@22.50
Milwaukee, Wis.		30.00
New York, N. Y.—Red and yellow Verona		32.00
Phillipsb'g, N. J.—Green stucco dash		9.00@14.00
Piqua, O.—Marble		7.00@ 9.00
Poultney, Vt. — Roofing granules		3.75
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.	12.00	14.00

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@35.00
Bellows Falls, Vt.	18.00	25.00
Birmingham, Ala.	13.50	25.00@35.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	22.50@25.00	50.00@75.00
Rochester, N. Y.	21.00	
Friesland, Wis.	20.00	
Houston, Tex.		19.50
Lockport, N. Y.	16.00	
Omaha, Neb.	18.00	30.00
Piqua, O.	15.00	25.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	18.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00@30.00	35.00@75.00
Salt Lake City, Utah	18.00	35.00
Seattle, Wash.	18.00@22.00	35.00@75.00
Springfield, Ill.	18.00	29.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	13.00@14.00	26.00@65.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	8.50
Boston, Mass.	13.00@14.00
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	12.00
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	12.75
Michigan City, Ind.	10.00
Milwaukee, Wis.	12.00@13.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	16.00
Washington, D. C.	13.50
Winnipeg, Can.	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	.....
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	.....

	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.	.....	12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.40
Denver, Colo.	.....	2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	.70*
San Francisco, Calif.	.....	1.90
Seattle, Wash.	3.25	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Iowa	2.33
Cincinnati, Ohio	2.38
Cleveland, Ohio	2.31
Chicago, Ill.	2.05
Dallas, Tex.	2.30
Davenport, Iowa	2.28
Denver, Colo.	2.65
Detroit, Mich.	2.33
Duluth, Minn.	2.04
Indianapolis, Ind.	2.26
Kansas City, Mo.	2.30
Los Angeles, Calif.	3.06
Milwaukee, Wis.	2.22
Minneapolis, Minn.	2.29
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.80
New York, N. Y. (includes bags)	2.40
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.09
Portland, Ore.	3.05
St. Louis, Mo.	2.10
San Francisco, Calif.	2.63
St. Paul, Minn.	2.29
Toledo, Ohio	2.33
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10", 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	.....	6.00	13.00	.....	10.50@12.00	.....	.....	.....	11.50@13.50	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	6.00	8.00	10.00	10.00	.....	.....	31.25	21.00	19.38	20.00	30.00
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Winnipeg, Man.	5.50	5.50	7.00	15.00	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News of All the Industry

Incorporations

The Smithson Stone Co., Cincinnati, O., has been incorporated for $10,000 by D. Smith and J. F. Mahoney.

The Southwest Granite Co., Austin, Tex., has been incorporated for $40,000 by W. Wagner, A. Nagel and W. W. Winkler.

The Maryland Calcite Co., Maryland, Texas, has been incorporated for $100,000 by R. L. Lovell, R. E. Tome and P. R. Nickerson.

The Independent Block and Cement Co., Indianapolis, Ind., has been incorporated for $10,000 and will manufacture and sell concrete building blocks.

The Sacramento Lime Co., Sacramento, Calif., has been incorporated for $200,000 by L. A. Bryon, Gary, Ind.; W. A. Latta and W. A. Sitton, Sacramento.

The Leicester Lime Corp., Brandon, Vt., has been incorporated for $100,000 and will engage in quarrying marble and lime. The incorporators are A. F. Morighoni, J. F. Grant and A. G. Ozek.

Quarries

The Standard Slag Co. is erecting a new $175,000 plant at Bellaire, Ohio, and will handle slag from all parts of the Wheeling district.

The Cohutta Talc Co., Dalton, Ga., is interested in securing some one to operate its property under lease. This company operates a plant and grinds talc to a fineness of 200 mesh.

The Bellefonte Lime Co., Salona, Pa., is quarrying, crushing and shipping 650 tons of crushed limestone a day. The output of the plant is used exclusively for state road work.

D. R. McArthur & Co., Kenton, Ohio, have opened the Brown stone quarry and have orders for gravel to be used in road construction. M. Orr is in charge.

Catoosa, Okla.—The Tibbets and Pleasant rock crusher, near Linn Lane, Okla., has resumed operations. The plant was erected by W. B. Hawkins.

The Gonzales Marble and Granite Works, Gonzales, Tex., has been sold to Ben Stella, Waco, Tex. Mr. Stella will take charge of the operations.

The United Indiana Stone Co., Bloomington, Ind., at a meeting of the stockholders elected J. H. Armintrout president, G. D. Thornton, vice-president and general manager and J. H. Huntington secretary and treasurer.

The Erie Stone Products Co., Sandusky, Ohio, recently organized, opened its stone quarries five miles south of Sandusky with 22 charges of dynamite set off at one time, loosening 30,000 tons of building stone.

The Columbia Quarry Co., Columbia, Ill., has made a proposition to the business men of Chester and the W. C. & W. railroad, that if Chester and the railroad takes $50,000 worth of preferred stock the company will erect a $100,000 quarry on the W. C. & W. at Chester.

Delta, Pa.—The Blue Mountain Stone Co., Hagerstown, Md., is making rapid progress on its new plant for slate grinding, near Delta. The mill will also be equipped with a dust collector, storage bins, crusher house, engine house, machine house, etc.

Austin, Tex.—Trap rock deposits at Pilot Knob will be developed by a $750,000 New York corporation. W. H. Bell, Austin, will have charge of construction work at the quarries. The material produced will be used in road construction work.

The American Agricultural Co., near Columbia, Tenn., is making speedy preparations to open up the phosphate fields in the Jameson and Spring Hill sections, and will erect a large plant with a capacity of 150 tons per day. A. J. Robertson is mine superintendent.

The Bloomington Stone Crusher Co., Bloomington, Ind., was destroyed by fire with a loss of $15,000. The fire was caused when an acetylene torch broke and the gas in it caught fire. The plant was owned by R. Rogers, A. F. McCormick and J. J. Campbell, who plan to rebuild.

Concrete Products

The Willbee Concrete Products Co. has been incorporated for $15,000 at Jackson, Mich.

The Snohomish Brick and Tile Co., Snohomish, Wash., has resumed operations. Frank Friese is the proprietor.

The American Concrete Industries Corp. has been incorporated at Wilmington, Del., for $775,000 to manufacture concrete machinery.

The Gulf Concrete Pipe Co., Inc., Houston, Tex., has been incorporated for $20,000, by N. A. Eppes, C. A. Sekerls and H. G. Fields.

The Shawner Construction Co., Lansing, W. Va., will install machinery for the manufacture of concrete block. J. A. Ellison is manager.

The Concrete Tie Corp., Portsmouth, Va., has been incorporated for $100,000 by W. L. Seccon, president, and H. W. MacKensie, secretary.

The Simplex Concrete Block Co., has been incorporated at Worcester, Mass., to manufacture and sell Simplex tile for house and building construction. G. B. Tabiesen is in charge.

The Geneva Brick Products Co., Inc., Geneva, N. Y., has been incorporated for $30,000. The directors of the company are R. A. Catchpole, M. J. O'Malley and H. G. Smith.

The Diamond Concrete Products Co. has been incorporated for $100,000 at Omaha, Neb. Incorporators are F. Whipperman, O. M. Whipperman and W. Ritchie, Jr.

Cement

Nashville, Ark.—The large cement and fertilizer plant now being constructed by Cincinnati capitalists at White Cliffs is nearing completion and is expected to be ready for business August 1. The company is capitalized at $1,000,000 and expects to do a large business when operations begin.

The Acme Cement Plaster Co. is developing a large industry at Gypsum, Ore., with cement plaster. The Portland school board has awarded the company a contract specifying hard wall plaster for finishing the new schools. The company is erecting a large building for office and warehousing distributive facilities and will greatly expand its facilities for service to contractors.

Lime

Salem, Ore.—The state lime plant at Gold Hill has resumed operations and will supply lime to farmers.

The White Sulphur Lime and Stone Co., Marysville, Ohio, has been purchased by the Big Four Railway Co. The consideration was more than $100,000.

The Southern States Lime Corp., Crab Orchard, Tenn., is arranging to install a hydrating plant costing $20,000. It is expected to be ready for service by September.

The Columbus Builders' Supply Co., Columbus, Ohio, was awarded the contract which calls for 110,000 bbl. cement to be used in the construction of the O'Shaughnessy dam.

The United Chemical Products Co., 609 Chamber of Commerce building, Pittsburgh, Pa., will build a new one-story plant at Buena Vista, Va., for the manufacture of fertilizer products, estimated to cost about $50,000. F. B. Deane is company engineer.

Sand and Gravel

George W. Moling, Columbus, Ohio, has purchased the J. Schell sand and gravel property at Walnut Grove near Martinsburg, W. Va., and is carrying on operations at the plant.

Little Rock, Ark.—The Texas Sand Co., Texarkana, has received a contract for furnishing the sand to be used in connection with the $200,000 paving improvement work here.

Personal

W. H. Kent, vice president and general manager of the Weller Manufacturing Co., left Chicago on June 28, for an extended trip throughout the European countries. Investigation will be made as to the possibilities of future trade also inspection of Weller equipment installed in a number of the large plants. At the present time there are a number of projects contemplated in which elevating, conveying and power transmitting machinery will be an important factor.

Manufacturers

The Hercules Powder Co., Wilmington, Del., announces a reduction in price on Hercules high explosives and blasting powder, effective July 1. Details can be obtained from any Hercules office.

Mark Kaplan, formerly manager of the mechanical rubber goods department of the George B. Carpenter Co., Chicago has associated himself with the sales department of the Victor Balata & Textile Belting Co., Chicago.

Trade Literature

Sacks—The Marquette Cement Manufacturing Co., Chicago, Ill., has issued a folder showing its new green and black sign as applied to its sacks. This sign will be used on all its sacks hereafter.

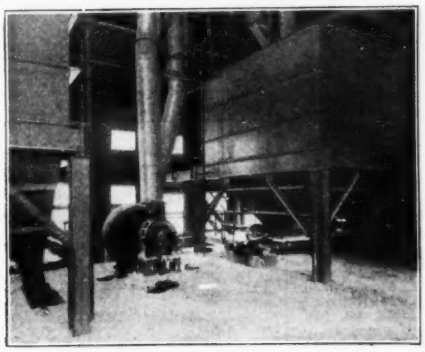
Motors—The Allis-Chalmers Co., Milwaukee, Wisc., has issued bulletin 1124 describing the general construction of its synchronous motors, and their applications in the industries. The bulletin also shows illustrations of installations and the services to which these motors are put.

Automatic Dump Body—This type of body manufactured by the Mandt Co., Keokuk, Iowa, is described in its recent folder and gives the dimensions of the 1-yd. 1½-yd. and 2-yd. heavy duty bodies put out by them. Also the automatic hopper type bodies built in 1½-yd. and 2-yd. capacities. The applications of these bodies are also explained.

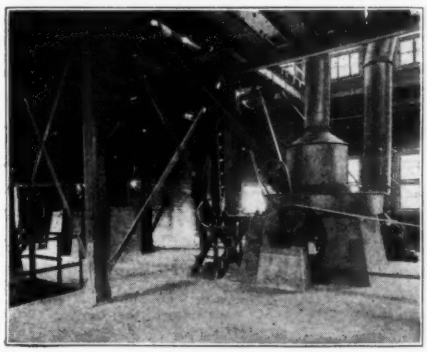
Crushers—The "100 a Year Club" book of suggestions, a very novel imitation of a 2-in. thick volume, published by Chalmers & Williams, Inc., Chicago Heights, Ill., is just off the press. This catalog explains the many advantages of the disc crusher, giving its dimensions, sizes and its various uses.

"The Dart" is a house organ published monthly by the Medart Co., St. Louis, Mo., formerly known as the Medart Patent & Pulley Co. The June issue gives an interesting story of the progress of the company since its establishment in the 70's; also its personnel, past and present. The company will shortly have a new catalog ready for distribution.

Resistance Thermometry—For the measurement of temperature and humidity the Brown Instrument Co., Philadelphia, Pa., has recently issued its Catalog No. 90. The Brown system includes sensitive insulated bulbs enclosed in moisture-proof receptacles for hygrometric or wet and dry bulb measurements, special switches which permit the rapid intercomparison of temperatures in remote localities, a compensated bridge for nullifying errors caused by lead resistances, a method for standardizing the indicating apparatus, and a variety of temperature bulbs for measuring temperatures ranging from 300 deg. minus F. to plus 1800 deg. F. Twenty-four pages are devoted to the excellencies of the Brown product.



Raymond Special Exhaust Fan Direct Connected to Motor



Raymond Roller Mill with Gypsum Dryer in Background at Left

Raymond Roller Mills For Hydrated Lime

For those producers of Hydrated Lime who have a high grade material from which they do not wish to remove the impurities such as core, sand, and over burned lime, Raymond Roller Mills will give just the kind of finished product wanted.

They will reduce all of the Hydrate, including the impurities, to a fine uniform powder which is Air-Separated to remove oversize material, and deliver finished product direct to storage bins above the bagger.

The grinding is done at an exceedingly low cost for power and repairs.

We invite correspondence from those who feel that all the lime can be ground up without removal of impurities and especially those who are now grinding on some other type of mill, as we feel that the figures we now have on operating costs will show that Raymond Roller Mills will pay for themselves in one to two years' time.

Raymond Bros. Impact Pulverizer Co.

1301 North Branch Street Chicago, Ill.

Western Office: 1002 Washington Bldg., Los Angeles, Calif.
Eastern Office: 50 Church St., New York City

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

FOR SALE

2—8x110′ Rotary Kilns.
6—5x6x7x110′ Rotary Kilns.
1—6x16′ Tube Mill, Silax Lined.
9—5x21′ Tube Mills, Steel Lining.
6—250 H.P. Oil City Water Tube Boilers.
1—4′ 6″x40′ Coal Dryer.
1—5′x46′ 6″ Rock Dryer.
1—No. 5 Gates Crusher.
8—Krupp Ball Mills.
8—33″ Fuller Mills.

Shafting, Pulleys, Bearings, and Elevator Equipment, all in first-class operating condition.

50 Acres of Land and Five Buildings. Stone and Steel Construction. Located at Stockertown, Pa.

ENGINEERING SALES COMPANY, Nashville, Tenn.
OLLIE LAWRENCE, Stockertown, Pa.

WANTED

1—Second hand 6 x 20, or 6 x 22, Krupp Tube Mill with Steel Heads.
1—Second hand No. 7½ McCully Crusher with Trade in No. 8 Austin Crusher.
8—Second hand 42″ Fuller-Mills with fan discharge.

Security Cement and Lime Co.
Hagerstown, Md.

Rotary Dryers

30 New Direct Fired Rotary Dryers, 4′-0″ Diam. 30 Feet Long

These Dryers were about to be put into operation as the armistice was signed and consequently were never used. We are offering them at a sacrifice, complete with driving mechanism, furnace iron, grates, etc. Some are equipped with steam radiators, for steam heated air drying.

McDERMOTT BROS. CO.
Allentown, Penna.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½ x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens; Richardson automatic scales; 8′ and 10′ Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

1—59-ton standard gauge Baldwin 6-wheel saddle tank switcher.
1—40-ton American 4-wheel saddle tank switcher.
2—50-ton standard gauge Brooks 6-wheel switchers.
1—42-ton standard gauge Shay geared locomotive.
2—18-ton 36″ gauge 4-wheel saddle tanks.
2—23-ton new 36″ gauge Porter 6-wheelers, with tenders.
1—20-ton Industrial Loco. Crane.
1—14-B Bucyrus steam shovel, mounted on traction wheels.

BIRMINGHAM RAIL & LOCOMOTIVE CO.
Birmingham, Ala.

FOR SALE CHEAP

1½-yd. drag line bucket. R. W. Dull, new.
1-yd. drag line bucket. R. W. Dull, used.
1—½-yd. Kiesler clamshell bucket, used.
600′ 1¼″ track line.
2—⅞″ guy lines 250′ long.
2—1¼″ guy lines 300′ long.
1—1½″ bridle line 200′ long.
1—bridle hitch.
1—18″ 3-wheel sheave.
1—18″ 2-wheel sheave.
1—18″ 1-wheel sheave.
1—⅞″ tension cable plow steel 550′ long.
1—2-wheel trolley carriage.
42—1½″ Crosby cable clamps.
2—18″ skidder sheaves.
2—4′x1¾″ 'U' bolts.
2—3′x1¼″ 'U' bolts.
1—2′x1¾″ 'U' bolts.
2—Anchor bolts 3″x8′.
1—Anchor bolt 2″x8′.
4—Oregon fir timbers 16″x6″x32′.

The above equipment can be seen at the plant of the

Moline Consumers Co., Ottawa, Ill.

FOR SALE

1 screen 4 ft. diameter x 10 ft long, punched 2 in.
1 screen 3 ft. diameter x 10 ft long, punched ¾ in.
1 screen 3 ft. diameter x 10 ft. long, punched ¼ in.
1 sand pan goes with each screen.
1 9x15 Blake Stone Crusher.
1 automatic sand settling tank.

All equipment in good second hand condition.

Clermont Brick & Sand Co.
Clermont, Iowa

FOR SALE

No. 2 Allis-Chalmers Gates Gyratory Crusher.
No. 3 Austin Gyratory Crusher.
No. 6 Austin Gyratory Crusher.
Two American Process type 24x48″ Rotary Dryers.
50′ continuous steel bucket (8″x16″) and chain elevator.
50′ continuous bucket (7″x13″) and belt elevator.
25 H.P. simple side crank Heilman steam engine.
125 H.P. 18″x24″ side crank Atlas steam engine.
75 H.P. 13″x16″ side crank Erie City steam engine.
Lidgerwood Standard double cylinder, two drum, 10″x12″ hoisting or cableway engine.
Two 150 H.P. General Electric Co. Induction motors, voltage 440 or 220, shop numbers 625140 and 1164925.
Williams No. 9 Swing hammer, Universal type pulverizer.
Worthington 10″ intake by 8″ discharge by 20 cylinders steam pump.
25 tons of 40 to 60 lb. rails.
7—2 yard, all steel, 48″ gauge end dump quarry cars.
One Sanderson cyclone No. 14 electric, non-traction well drill and equipment.

ADDRESS
E. W. Cooper, Engineer
174 3rd Ave. No., Nashville, Tenn.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

FOR RENT AND SALE

20—12 yd. Western dump cars, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 791, ¾-yd. bucket, used 8 months.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, used 6 months.
1—Marion 76 steam shovel, No. 3503, std. gauge, weight 110 tons, used 10 months.
1—No. 2 Brownhoist 4-wheel gas. crane, std. gauge, 40-ft. boom, ½-yd. bucket, new 1921.
64—NEW 18-in. I-beams, 80 lbs. per ft., 40 ft. long, not drilled.
1—NEW Lakewood concrete chuting system.
6—NEW wood-burning locomotive-stacks.

LOCOMOTIVES

1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24-in. four-wheel switcher.
2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
2—18, 14 and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1¼ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—⅝ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

IMMEDIATE DELIVERY

SEND US YOUR STEAM SHOVEL INQUIRIES
66x86 in. TRAYLOR JAW CRUSHER.
No. 18K GATES CRUSHER.
50-75 HP. Single Drum Hoists, 25 Cy. Motors.
25-40-50 HP. D.D. Hoists, 60 Cy., 220-440 V., 3 Ph.
Nos. 3-5-6-7½ & 8K CRUSHERS.
6 and 12 ton Gasoline Locomotives.
10x12 in. Steam Hoist, 3 Drum.
2—DISC CRUSHERS, 36" SYMONS.
2 — 60 ft. BARBER-GREEN 18" BELT CONVEYORS.
100 TON 2½ YD. ELEC. SHOVEL.
50 to 5000 ft. Steam, Belt & Elec. Compressors.
JAW and ROLL CRUSHERS.
10-15 & 20 Ton Locomotive Cranes.
13x30 in., 9x14 in. and Other Jaw Crushers.
24x54 McLANAHAN ROLL CRUSHER.
Send us your inquiries for Steam Engine, Centrifugal Pumps, Quarry & Cont. Equip., Etc.
ROSS POWER EQUIP. CO., Indianapolis, Ind.

"DREDGING PUMP" FOR SALE

One 10" Morris Sand and Gravel dredging pump, 10" suction, 10" discharge, direct connected to double 9x9 engines.
One Scotch Marine Boiler, 200 H. P.

M. A. CALLAHAN
"The Sand Man"
Schofield Bldg. Cleveland, Ohio

FOR SALE

1—De La Vergne 50-hp. Oil Engine in very good condition—Cleveland, Ohio.

1—No. 0 Thew Steam Shovel, ⅝-yard dipper, in good condition—Somerdale, Ohio.

Attractive Prices—Immediate Delivery.

The Superior Sand Company
511 Guardian Building CLEVELAND, OHIO

WANTED

2 steel tanks—25 or 30 tons' capacity.

Capital Builders Supply, Inc.
1402 Eye St. N. W., Washington, D. C.

Classified Advertising

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

H. E. WIEDEMANN
(Est. 1905)
Consulting and Analytical Chemist
Specialist in Analysis of Rock Products
Chemical Bldg. St. Louis

WANTED

Party owning small steam shovel to load steel moulding sand. Will enter into long contract.

COMMONWEALTH SILICA CO.
Ottawa, Illinois

SALESMAN WANTED

Traveling Salesman in Missouri and Illinois for old established Lime and Building Material Company; permanent position with future for the right party. Give full particulars in first letter, including experience and salary wanted. Address

Box 1573, Care of Rock Products
542 South Dearborn Street Chicago, Illinois

FOR SALE

92 acres of the purest high calcium limestone in the United States. Located at St. Genevieve, Mo., and adjacent to the Missouri-Illinois R. R. A splendid opportunity for a lime manufacturer that wishes to locate in this locality. Lime from this vicinity has a national demand and a modern lime plant would pay for itself in two years. Address

Mr. J. E. Schuerman
The St. Louis Steel Erection Co.
Syndicate Trust Bldg.
St. Louis, Mo.

POSITION OPEN

for superintendent quarry and crushing plant. Must be competent to handle quarry and plant. Give reference and full information. Also, salary expected. Address

Box 1574, Rock Products
542 South Dearborn Street, Chicago, Ill.

FOR SALE

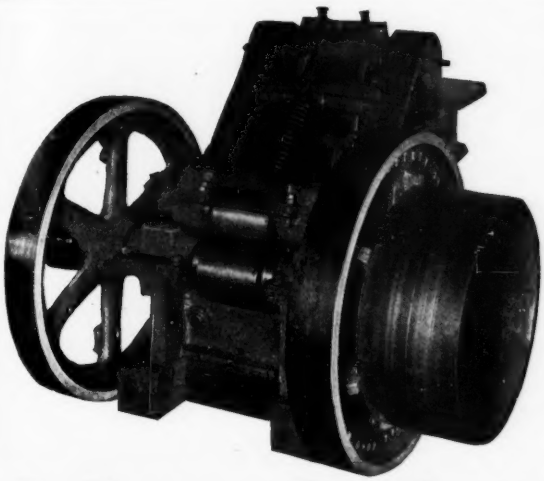
Rock crushing plant on railroad, 60 miles from Louisville; present capacity 10 cars daily; could be greatly increased. Complete, modern plant; 16 cottages, store, etc. In operation 11 years. Fine territory for product; 300 acres of land, some timber. Owner wants to retire, and will make attractive proposition to purchaser.

C. A. SINGER, Realtor
426 W. Liberty St., Louisville, Ky.

BOOKS AND FORMULAS

Concrete Men: Send one dollar for my guaranteed formulas and instructions on concrete, artificial stone, marbles, floors, sinks, washtubs, silos, troughs, buildings, etc. Book form and designs $1.50. Government tests, copyright included.

N. P. DUBUC, Jr., Cement Expert
109 Princeton St. New Bedford, Mass.



Reliance Crushers

IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

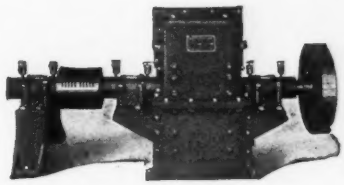
Let us quote you prices

Universal Road Machinery Co., Kingston, N. Y.

Branches in all principal cities in U. S. and Canada

MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT

"K-B" ALL-STEEL PULVERIZER



High Production
Low Power Cost

The efficiency of any machine lies in its ability to do a large amount of work with a small consumption of power.

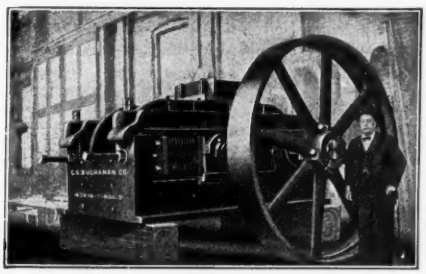
The "K-B" does this!

Ask us for full information

K-B PULVERIZER

K-B Pulverizer Company, Inc.
92 Lafayette Street, New York

BUCHANAN CRUSHING ROLLS



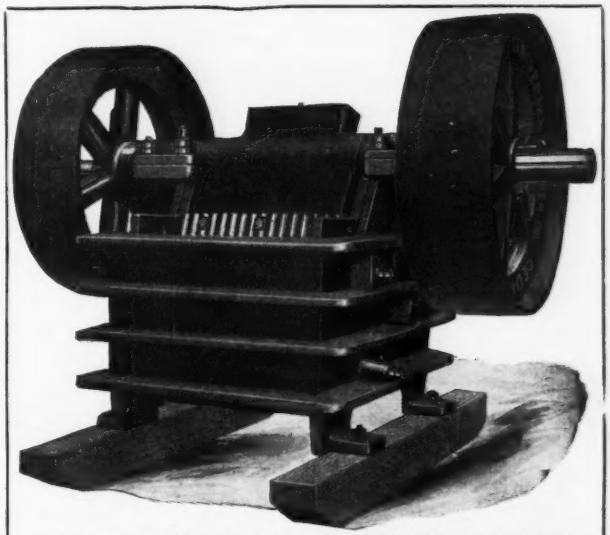
Type "C" Buchanan Box Bed Crushing Rolls for Heavy Duty Bulletin No. 13

Years of manufacturing experience, combined with an intimate knowledge of the conditions under which such machines operate, assures the purchaser of Buchanan Equipment machines of remarkable durability.

COMPLETE CRUSHING PLANTS

C. G. BUCHANAN CO., Inc.

Cedar and West Streets NEW YORK CITY



UNIVERSAL STEEL LINE

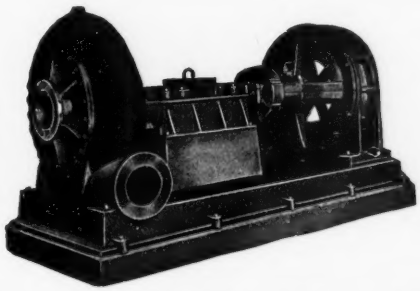
THE PERFECT GRAVEL AND REJECTION CRUSHER

Sizes up to 8"x36". Capacities 20 to 200 tons daily. Crushes to ¾" and finer if desired. Has no superior for FINE CRUSHING and UNIFORMITY of product.

STRONG LIGHT DURABLE ECONOMICAL

UNIVERSAL CRUSHER CO.

225 Third Street Cedar Rapids, Iowa, U. S. A.



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4" up, arranged for belt, motor, or engine drive.

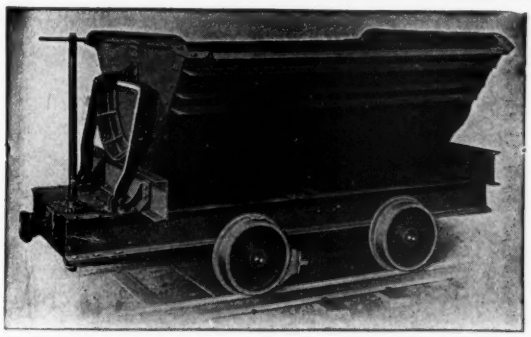
MORRIS MACHINE WORKS
50 Genesee St. Baldwinsville, N. Y.

39 Cortlandt St., New York City
Real Estate Trust Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.
Penobscot Bldg., Detroit, Mich.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

MORRIS

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines



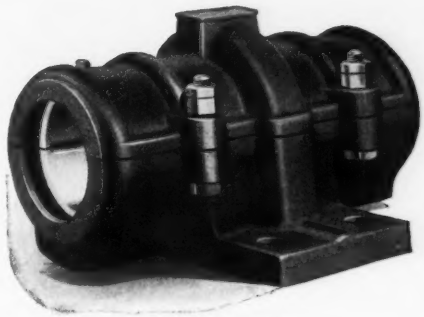
More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

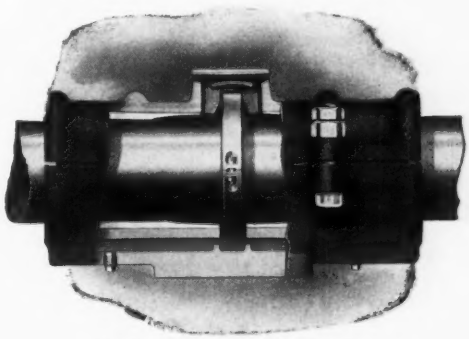
The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.

Lubrication Is Positive Economical and Safe



Collar Oiling Flat Box

Reduce lubrication expense in your operation by using bearings of the type shown.



Sectional View of Collar Oiling Box

Building a complete line of reliable power transmission machinery, we offer the services of our engineers to help solve your transmission problems and request the opportunity to quote on your requirements. With our splendid facilities there is no inquiry too small for our careful attention nor too large for us to handle.

ALLIS-CHALMERS
MANUFACTURING COMPANY

ELECTRICAL MACHINERY
STEAM TURBINES — STEAM ENGINES
HYDRAULIC TURBINES
GAS ENGINES — OIL ENGINES
MINING MACHINERY
CRUSHING AND CEMENT MACHINERY
FLOUR AND SAW MILL MACHINERY

PUMPING ENGINES
CENTRIFUGAL PUMPS
CONDENSERS
AIR COMPRESSORS — AIR BRAKES
STEAM AND ELECTRIC HOISTS
AGRICULTURAL MACHINERY
POWER TRANSMISSION MACHINERY

MILWAUKEE, WISCONSIN. U.S.A.

Buyers' Directory
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AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AIR COMPRESSORS
Bury Compressor Co., Erie, Pa.

AUTOMATIC WEIGHERS
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Co., The, Jaite, Ohio.

BARREL MAKING MACHINERY
Stoll Co., The D. H., Buffalo, N. Y.

BINS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Neff & Fry, Camden, Ohio (concrete stone).
Weller Mfg. Co., Chicago, Ill. (storage).

BIN GATES
Allis-Calmers Mfg. Co., Milwaukee, Wis.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BOILERS, WASTE, HEAT
Freeman Mfg. Co., Racine, Wis.

BUCKETS—Elevator
Brown Hoisting Machinery Co., Cleveland, Ohio.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

BUCKETS
Brown Hoisting Machinery Co., Cleveland, Ohio.
McMyler Interstate Co., Cleveland, Ohio.

CABLEWAYS
Flory Mfg. Co., S., Bangor, Pa.
Interstate Equip Co., New York, N. Y.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Watt Mining Car Wheel Co., Barnesville, Ohio.

CAR PULLERS
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.

CEMENT MILL REPAIRS
Moore & Moore, Reading Pa.

CHAIN, MANGANESE SPROCKET
Moore & Moore, Reading Pa.

CLUTCHES
Webster Mfg. Co., Chicago, Ill.

CONVEYORS AND ELEVATORS
Jeffrey Mfg. Co., The, Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.

CRANES—Locomotive Gantry
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
McMyler-Interstate Co., Cleveland, Ohio.
Northwest Eng. Co., Green Bay, Wis.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Kaltenthaler, H. J., Philadelphia, Pa.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.
Moore & Moore, Reading, Pa.

CLUTCHES
Weller Mfg. Co., Chicago, Ill.

DERRICKS
Mundy Hoisting Engine Co., J. S., Newark, N. J.
Terry Mfg. Co., New York, N. Y.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.

DREDGING MACHINERY
Flory Mfg. Co., S., Bangor, Pa.

DRILLS
Sanderson Cyclone Drill Co., Orrville, Ohio.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Buckbee Co., J. C., Chicago, Ill.
Crow, Waller, Inc., Chicago, Ill.
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Hunt, R. W., & Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Northwest Eng. Co., Green Bay, Wis.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.

GEARS
Plamondon Mfg. Co., Chicago, Ill.

GENERATORS
Burke Electric Co., Erie, Pa.

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GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
Flory Mfg. Co., S., Bangor, Pa.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

LIME HANDLING EQUIPMENT
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Brookville Truck & Tractor Co., Brookville, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Industrial Equip. Co., Minster, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MALLEABLE CHAIN
Moore & Moore, Reading, Pa.

MOTORS, ELECTRIC
Burke Electric Co., Erie, Pa.

MOTOR TRUCKS
Traylor Eng. & Mfg. Co., Allentown, Pa.

PAINT AND COATINGS
Williams, C. K., & Co., Eaton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

POWER TRANSMITTING MACHINERY
Webster Mfg. Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PULLEYS
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

QUARRY EQUIPMENT
Universal Road Mach. Co., Kingston, N. Y.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SCALES
Richardson Scale Co., Passaic, N. J.

SCRAPERS, DRAG
Sauerman Bros., Chicago, Ill.

SCREENS
Chicago Perf. Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam and Electric
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Northwest Eng. Co., Green Bay, Wis.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SPROCKETS
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SPROCKET CHAIN
Webster Mfg. Co., Chicago, Ill.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.

STORAGE BINS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Neff & Fry, Camden, Ohio.

STUCCO FACINGS
Metro-Nite Co., Milwaukee, Wis.
Vermont Milling Products Co., Fair Haven, Vt.

SWITCHES AND FROGS
Central Frog & Switch Co., Cincinnati, Ohio.

TANKS, STEEL STORAGE
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND TESTING SIEVE SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

TRANSFORMERS
Burke Electric Co., Erie, Pa.

TRANSMISSION MACHINERY
Plamondon Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

WASHERS, SAND AND GRAVEL
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

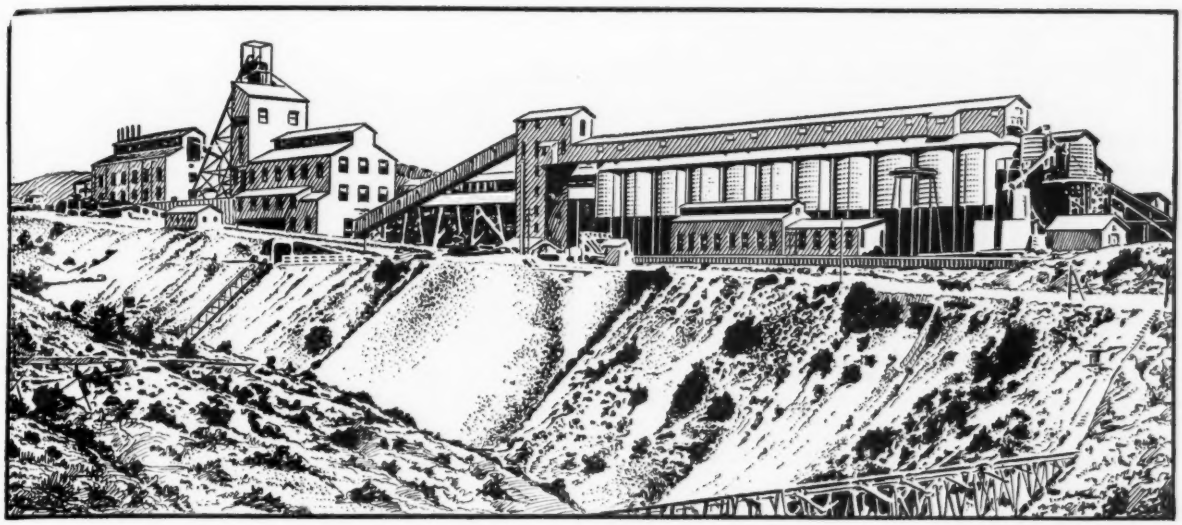
WEIGHING EQUIPMENT
Richardson Scale Co., Passaic, N. J.

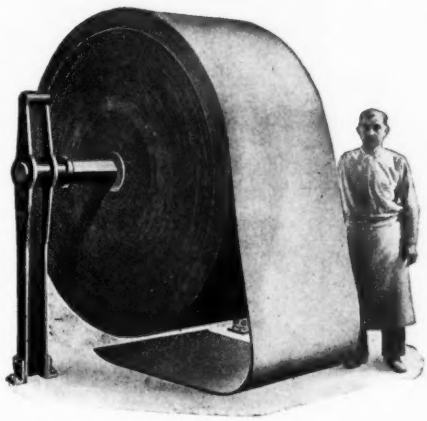
WELDING EQUIPMENT
Burke Electric Co., Erie, Pa.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.
Williamsport Wire Rope Co., Williamsport, Pa.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
Tyler Co., The W. S., Cleveland, Ohio.

INDEX TO ADVERTISEMENTS





Conveying 9,357,000 Tons of Ore With One Belt

Read This Remarkable Record Made at Miami Copper Company's Mine

Seven years service from this conveyor belt is the record run made at Miami, a period of usefulness extending through the rush of war production.

The belt cost for conveying this huge quantity of ore is 66/1000 of a cent per ton, truly a remarkable figure for any service.

Width of belt, 30 inches.
Number of plies, 6.
Thickness of cover:
Conveyor side, ⅛ inch.
Pulley side, 1/32 inch.
Date installed, March 11, 1911.
Date taken off, June 1, 1918.

This belt was installed in two sections. The inclined belt, operating at an angle of 3½ inches in 12 inches is 530 feet in length, and the horizontal belt which distributes ore to the bins is 680 feet long.

This installation is an example of a conveyor belt designed by our belt men after careful investigation of all the operating conditions.

These facts determine the character of the rubber compounds used, the kind and weight of duck, and the correct number of plies.

The result is a belt of wear-defying construction that comes through the test of heavy work with cost figures well on the credit side.

Before you buy another conveyor belt, send us the particulars regarding your requirements and we will gladly make recommendations for a suitable belt and submit costs.

NEW YORK BELTING & PACKING CO.

New York
Boston
Chicago
El Paso
Philadelphia
Pittsburgh
St. Louis
Salt Lake City
San Francisco

CONVEYOR BELTING FOR HEAVY MINING SERVICE